

FIGURE 1

**Subclones of portions of the 200 kDa protein gene from λ EMBL3
clone 8II and PCR amplification of 5' region**

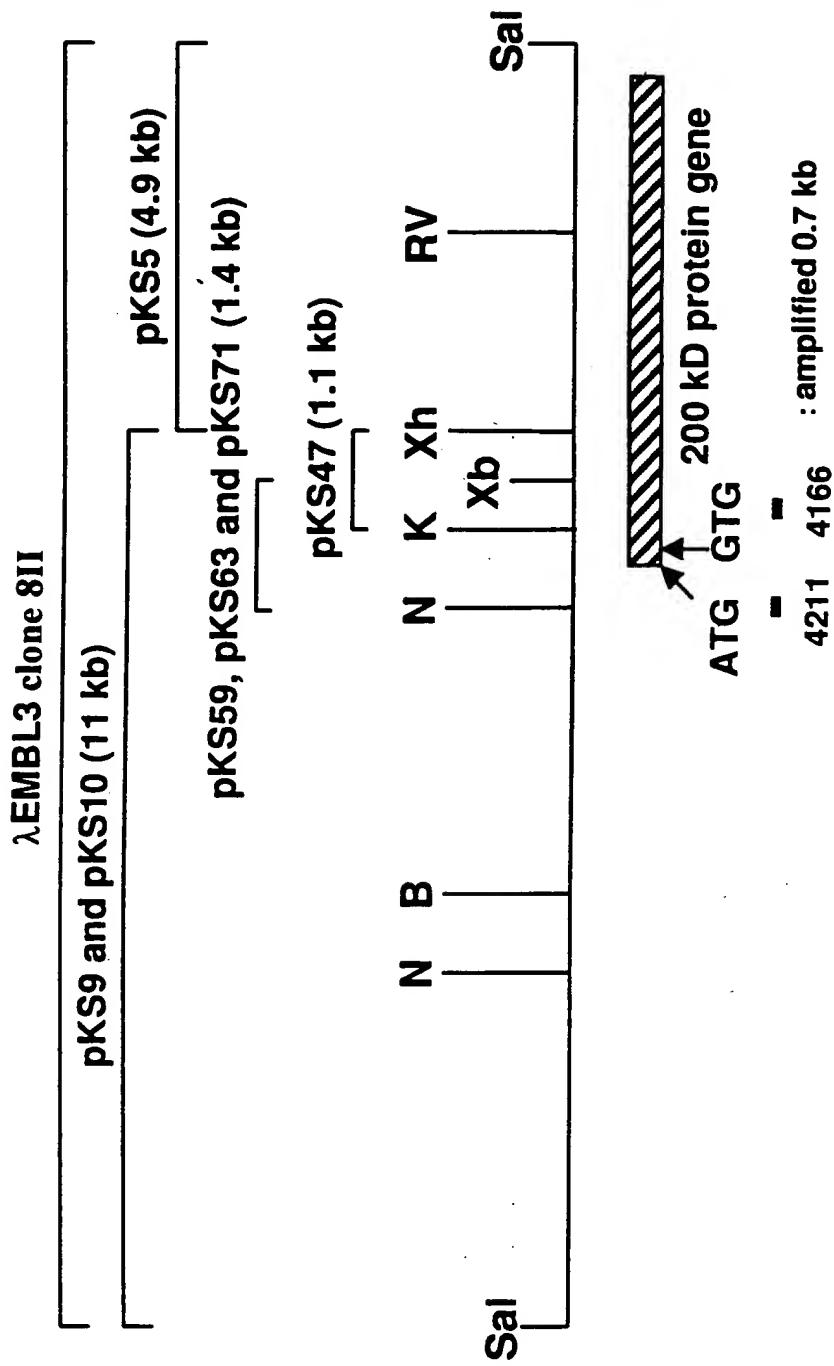


Figure 2. *M. catarrhalis* strain 4223 λEMBL3 clone 200kDa gene

ccatggatat gggcagggtgt gctcgctgc cgtatgatgg cgatgacacc ccatttgc 60
catatctgta cgatttgaca tgtgatatga tttaacatgt gacatgattt aacattgttt 120
aatactgttgc ccatcattac cataattttag taacgcattt agtaacgcattt ttgtaaaaat 180
cattgcgc 60
ctttatgtgt atcatatgaa tagaatatta tgattgtatc tgattattgt 240
atcagaatgg tgatgctata tgatgatgcc tacgagttga tttgggttaa tcactctatg 300
atttgatata ttttggaaact aatctattga cttaaatcac catatggta taatttagca 360
taatggtagg cttttgtaa aaatcacatc gcaatattgt tctactgtta ctaccatgct 420
tgaatgacga tcccaatcac cagattcatt caagtgtatgt gtttgtatc gcaccattta 480
ccctaattat ttcaatcaa tgcctatgtc agcatgtatc attttttaa ggtaaaccac 540
catgaatcac atctataaag tcacatctttaa caaagccaca ggcacattta tggcagtggc 600
agagtacgcc aaatcccaca gcacgggggg ggggtagctg tgctacaggg caagttggca 660
gtgtatgcac tctgagctt gcccgtattt cgcgcgtcgc tgcgttcgtt gtg atc ggt 716
Val Ile Gly
1
gca acg ctc agt ggc agt gct tat gct caa aaa aaa gat acc aaa cat 764
Ala Thr Leu Ser Gly Ser Ala Tyr Ala Gln Lys Lys Asp Thr Lys His
5 10 15
atc gca att ggt gaa caa aac cag cca aga cgc tca ggc act gcc aag 812
Ile Ala Ile Gly Glu Gln Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys
20 25 30 35
gcg gac ggt gat cga gcc att gct att ggt gaa aat gct aac gca cag 860
Ala Asp Gly Asp Arg Ala Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln
40 45 50
ggc ggt caa gcc atc gcc atc ggt agt agt aat aaa act gtc aat gga 908
Gly Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr Val Asn Gly
55 60 65
agc agt ttg gat aag ata ggt acc gat gct acg ggt caa gag tcc atc 956
Ser Ser Leu Asp Ile Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile
70 75 80
gcc atc ggt ggt gat gta aag gct agt ggt gat gcc tcg att gcc atc 1004
Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile
85 90 95
ggt agt gat gac tta cat ttg ctt gat cag cat ggt aat cct aaa cat 1052
Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn Pro Lys His
100 105 110 115
ccg aaa ggt act ctg att aac gat ctt att aac ggc cat gca gta tta 1100
Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His Ala Val Leu
120 125 130

aaa gaa ata cga agc tca aag gat aat gat gta aaa tat aga cgc aca		1148	
Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr			
135	140	145	
acc gca agc gga cac gcc agt act gca gtg gga gcc atg tca tat gca		1196	
Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met Ser Tyr Ala			
150	155	160	
cag ggt cat ttt tcc aac gcc ttt ggt aca cgg gca aca gct aaa agt		1244	
Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser			
165	170	175	
gcc tat tcc ttg gca gtg ggt ctt gcc gcc aca gag ggc caa tct		1292	
Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser			
180	185	190	195
aca atc gct att ggt tct gat gca aca tct agc tcg ttg gga gcg ata		1340	
Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Leu Gly Ala Ile			
200	205	210	
gcc ctt ggt gca ggt act cgt gct cag cta cag ggc agt att gcc cta		1388	
Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu			
215	220	225	
ggt caa ggt tct gtt gtc act cag agt gat aat aat tct aga ccg gcc		1436	
Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala			
230	235	240	
tat aca cca aat acc cag gca cta gac ccc aag ttt caa gcc acc aat		1484	
Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn			
245	250	255	
aat acg aag gcg ggt cca ctt tcc att ggt agt aac tct atc aaa cgt		1532	
Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg			
260	265	270	275
aaa atc atc aat gtc ggt gca ggt gtt aat aaa acc gat gcg gtc aat		1580	
Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp Ala Val Asn			
280	285	290	
gtg gca cag cta gaa gcg gtg gtg aag tgg gct aag gag cgt aga att		1628	
Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu Arg Arg Ile			
295	300	305	
act ttt cag ggt gat gat aac agt act gac gta aaa ata ggt ttg gat		1676	
Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile Gly Leu Asp			
310	315	320	
aat act tta act att aaa ggt ggt gca gag acc aac gca tta acc gat		1724	
Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp			
325	330	335	
aat aat atc ggt gtg gta aaa gag gct gat aat agt ggt ctg aaa gtt		1772	
Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly Leu Lys Val			
340	345	350	355
aaa ctt gct aaa act tta aac aat ctt act gag gtg aat aca act aca		1820	
Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn Thr Thr			

360

365

370

tta aat gcc aca acc aca gtt aag gta ggt agt agt agt agt act aca Leu Asn Ala Thr Thr Thr Val Lys Val Gly Ser Ser Ser Ser Thr Thr 375	380	385	1868
gct gaa tta ttg agt gat agt tta acc ttt acc cag ccc aat aca ggc Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly 390	395	400	1916
agt caa agc aca agc aaa acc gtc tat ggc gtt aat ggg gtg aag ttt Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly Val Lys Phe 405	410	415	1964
act aat aat gca gaa aca aca gca gca atc ggc act act cgt att acc Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr 420	425	430	2012
aga gat aaa att ggc ttt gct cga gat ggt gat gtt gat gaa aaa caa Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp Glu Lys Gln 440	445	450	2060
gca cca tat ttg gat aaa aaa caa ctt aaa gtg ggt agt gtt gca att Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser Val Ala Ile 455	460	465	2108
acc ata gac aat ggc att gat gca ggt aat aaa aag atc agt aat ctt Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu 470	475	480	2156
gcc aaa ggt agc agt gct aac gat gcg gtt acc atc gaa cag ctc aaa Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu Gln Leu Lys 485	490	495	2204
gcc gcc aag cct act tta aac gca ggc gct ggc atc agt gtc aca cct Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser Val Thr Pro 500	505	510	2252
act gaa ata tca gtt gat gct aag agt ggc aat gtt acc gcc cca act Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr Ala Pro Thr 520	525	530	2300
tac aac att ggc gtg aaa acc acc gag ctt aac agt gat ggc act agt Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser 535	540	545	2348
gat aaa ttt agt gtt aag ggt agt ggt acg aac aat agc tta gtt acc Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser Leu Val Thr 550	555	560	2396
gcc gaa cat ttg gca agc tat cta aat gaa gtc aat cga acg gct gac Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp 565	570	575	2444
agt gct cta caa agc ttt acc gtt aaa gaa gaa gac gat gat gac gcc Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp Asp Asp Ala 580	585	590	2492
aac gct atc acc gtg gct aaa gat acg aca aaa aat gcc ggc gca gtc			2540

Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala Gly Ala Val
600 605 610

agc atc tta aaa ctc aaa ggt aaa aac ggt cta acg gtt gct acc aaa 2588
Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val Ala Thr Lys
615 620 625

aaa gat ggt acg gtt acc ttt ggg ctt agc caa gat agc ggt ctg acc 2636
Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr
630 635 640

att ggc aaa agc acc cta aac aac gat ggc ttg act gtt aaa gat acc 2684
Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val Lys Asp Thr
645 650 655

aac gaa caa atc caa gtc ggt gct aat ggc att aaa ttt act aat gtg 2732
Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe Thr Asn Val
660 665 670 675

aat ggt agt aat cca ggt act ggc att gca aat acc gct cgc att acc 2780
Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala Arg Ile Thr
680 685 690

aga gat aaa att ggc ttt gct ggt tct gat ggt gca gtt gat aca aac 2828
Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val Asp Thr Asn
695 700 705

aaa cct tat ctt gat caa gac aag cta caa gtt ggc aat gtt aag att 2876
Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn Val Lys Ile
710 715 720

acc aac act ggc att aac gca ggt ggt aaa gcc atc aca ggg ctg tcc 2924
Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser
725 730 735

cca aca ctg cct agc att gcc gat caa agt agc cgc aac ata gaa ctg 2972
Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu
740 745 750 755

ggc aat aca atc caa gac aaa gac aaa tcc aac gct gcc agc att aat 3020
Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn
760 765 770

gat ata tta aat aca ggc ttt aac cta aaa aat aat aac aac ccc att 3068
Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn Pro Ile
775 780 785

gac ttt gtc tcc act tat gac att gtt gac ttt gcc aat ggc aat gcc 3116
Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn Gly Asn Ala
790 795 800

acc acc gcc aca gta acc cat gat acc gct aac aaa acc agt aaa gtg 3164
Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr Ser Lys Val
805 810 815

gta tat gat gtg aat gtg gat gat aca acc att cat cta aca ggc act 3212
Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu Thr Gly Thr
820 825 830 835

gat gac aat aaa aaa ctt ggc gtc aaa acc acc aaa ctg aac aaa aca 3260
Asp Asp Asn Lys Lys Leu Gly Val Thr Thr Lys Leu Asn Lys Thr
840 845 850

agt gct aat ggt aat aca gca act aac ttt aat gtt aac tct agt gat 3308
Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn Ser Ser Asp
855 860 865

gaa gat gcc ctt gtt aac gcc aaa gac atc gcc gaa aat cta aac acc 3356
Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr
870 875 880

cta gcc aag gaa att cac acc acc aaa ggc aca gca gac acc gcc cta 3404
Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu
885 890 895

caa acc ttt acc gtt aaa aag gta gat gaa aat aat aat gct gat gac 3452
Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Ala Asp Asp
900 905 910 915

gcc aac gcc atc acc gtg ggt caa aag aac gca aat aat caa gtc aac 3500
Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn Gln Val Asn
920 925 930

acc cta aca ctc aaa ggt gaa aac ggt ctt aat att aaa acc gac aaa 3548
Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys
935 940 945

aat ggt acg gtt acc ttt ggc att aac acc aca agc ggt ctt aaa gcc 3596
Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Ser Gly Leu Lys Ala
950 955 960

ggc aaa agc acc cta aac gac ggt ggc ttg tct att aaa aac ccc act 3644
Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr
965 970 975

ggt agc gaa caa atc caa gtc ggt gct gat ggc gtg aag ttt gcc aag 3692
Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys Phe Ala Lys
980 985 990 995

gtt aat aat aat ggt gtt gta ggt gct gat ggc att gat ggc aca act cgc 3740
Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly Thr Thr Arg
1000 1005 1010

att acc aga gat gaa att ggc ttt act ggg act aat ggc tca ctt gat 3788
Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp
1015 1020 1025

aaa agc aaa ccc cac cta agc aaa gac ggc att aac gca ggt ggt aaa 3836
Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys
1030 1035 1040

aag att acc aac att caa tca ggt gag att gcc caa aac agc cat gat 3884
Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn Ser His Asp
1045 1050 1055

gct gtg aca ggc ggc aag att tat gat tta aaa acc gaa ctt gaa aac 3932
Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn
1060 1065 1070 1075

aaa atc agc agt act gcc aaa aca gca caa aac tca tta cac gaa ttc Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu His Glu Phe	1080	1085	1090	3980
tca gta gca gat gaa caa ggt aat aac ttt acg gtt agt aac cct tac Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr	1095	1100	1105	4028
tcc agt tat gac acc tca aag acc tct gat gtc atc acc ttt gca ggt Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala Gly	1110	1115	1120	4076
gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg cgt gtg ggc Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val Gly	1125	1130	1135	4124
att gac caa acc aaa ggc tta acc acg cct aag ctg acc gtg ggt aat Ile Asp Gln Thr Lys Gly Leu Thr Pro Lys Leu Thr Val Gly Asn	1140	1145	1150	1155
aat aat ggc aaa ggc att gtc att gac agc caa aat ggt caa aat acc Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly Gln Asn Thr	1160	1165	1170	4220
atc aca gga cta agc aac act cta gct aat gtt acc aat gat aaa ggt Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Lys Gly	1175	1180	1185	4268
agc gta cgc acc aca gaa cag ggc aat ata atc aaa gac gaa gac aaa Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys	1190	1195	1200	4316
acc cgt gcc gcc agc att gtt gat gtg cta agc gca ggc ttt aac ttg Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu	1205	1210	1215	4364
caa ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat gac acc gtc Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val	1220	1225	1230	1235
aac ttt gcc gat ggc aat gcc acc acc gct aag gtg acc tat gat gac Asn Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp	1240	1245	1250	4460
aca agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg gat gat aca Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr	1255	1260	1265	4508
acc att gaa gtt aaa gat aaa aaa ctt ggc gta aaa acc acc aca ttg Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr Thr Leu	1270	1275	1280	4556
acc agt act ggc aca ggt gct aat aaa ttt gcc cta agc aat caa gct Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala	1285	1290	1295	4604
act ggc gat gcg ctt gtc aag gcc agt gat atc gtt gct cat cta aac Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn				4652

1300	1305	1310	1315	
acc tta tct ggc gac atc caa act gcc aaa ggg gca agc caa gcg aac				4700
Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn				
1320	1325	1330		
aac tca gca ggc tat gtg gat gct gat ggc aat aag gtc atc tat gac				4748
Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp				
1335	1340	1345		
agt acc gat aac aag tac tat caa gcc aaa aat gat ggc aca gtt gat				4796
Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp				
1350	1355	1360		
aaa acc aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa gcc caa acc				4844
Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr				
1365	1370	1375		
cca gat ggc aca ttg gct caa atg aat gtc aaa tca gtc att aac aaa				4892
Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys				
1380	1385	1390	1395	
gaa caa gta aat gat gcc aat aaa aag caa ggc atc aat gaa gac aac				4940
Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn				
1400	1405	1410		
gcc ttt gtt aaa gga ctt gaa aaa gcc gct tct gat aac aaa acc aaa				4988
Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys				
1415	1420	1425		
aac gcc gca gta act gtg ggt gat tta aat gcc gtt gcc caa aca ccg				5036
Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro				
1430	1435	1440		
ctg acc ttt gca ggg gat aca ggc aca acg gct aaa aaa ctg ggc gag				5084
Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu				
1445	1450	1455		
act ttg acc atc aaa ggt ggg caa aca gac acc aat aag cta acc gat				5132
Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp				
1460	1465	1470	1475	
aat aac atc ggt gtg gta gca ggt act gat ggc ttc act gtc aaa ctt				5180
Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu				
1480	1485	1490		
gcc aaa gac cta acc aat ctt aac agc gtt aat gca ggt ggc acc aaa				5228
Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys				
1495	1500	1505		
att gat gac aaa ggc gtg tct ttt gta gac tca agc ggt caa gcc aaa				5276
Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys				
1510	1515	1520		
gca aac acc cct gtg cta agt gcc aat ggg ctg gac ctg ggt ggc aag				5324
Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys				
1525	1530	1535		
gtc atc agt aat gtg ggc aaa ggc aca aaa gat acc gac gct gcc aat				5372

Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn
1540 1545 1550 1555

gta caa cag tta aac gaa gta cgc aac ttg ttg ggt ctt ggt aat gct 5420
Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala
1560 1565 1570

ggt aat gat aac gct gac ggc aat cag gta aac att gcc gac atc aaa 5468
Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys
1575 1580 1585

aaa gac cca aat tca ggt tca tca tct aac cgc act gtc atc aaa gca 5516
Lys Asp Pro Asn Ser Gly Ser Ser Asn Arg Thr Val Ile Lys Ala
1590 1595 1600

ggc acg gta ctt ggc ggt aaa ggt aat aac gat acc gaa aaa ctt gcc 5564
Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala
1605 1610 1615

act ggt ggt ata caa gtg ggc gtg gat aaa gac ggc aac gct aac ggc 5612
Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly
1620 1625 1630 1635

gat tta agc aat gtt tgg gtc aaa acc caa aaa gat ggc agc aaa aaa 5660
Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys
1640 1645 1650

gcc ctg ctc gcc act tat aac gcc gca ggt cag acc aac tat ttg acc 5708
Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr
1655 1660 1665

aac aac ccc gca gaa gcc att gac aga ata aat gaa caa ggt atc cgc 5756
Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg
1670 1675 1680

ttc ttc cat gtc aac gat ggc aat caa gag cct gtg gta caa ggg cgt 5804
Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg
1685 1690 1695

aac ggc att gac tca agt gcc tca ggc aag cac tca gtg gcg ata ggt 5852
Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly
1700 1705 1710 1715

ttc cag gcc aag gca gat ggt gaa gcc gcc gtt gcc ata ggc aga caa 5900
Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln
1720 1725 1730

acc caa gca ggc aac caa tcc atc gcc atc ggt gat aac gca caa gcc 5948
Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala
1735 1740 1745

acg ggc gat caa tcc atc gcc atc ggt aca ggc aat gtg gta gca ggt 5996
Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly
1750 1755 1760

aag cac tct ggt gcc atc ggc gac cca agc act gtt aag gct gat aac 6044
Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn
1765 1770 1775

DRAFT

agt tac agt gtg ggt aat aac aac cag ttt acc gat gcc act caa acc Ser Tyr Ser Val Gly Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr 1780 1785 1790 1795	6092
gat gtc ttt ggt gtg ggc aat aac atc acc gtg acc gaa agt aac tcg Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu Ser Asn Ser 1800 1805 1810	6140
gtt gcc tta ggt tca aac tct gcc atc agt gca ggc aca cac gca ggc Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly 1815 1820 1825	6188
aca caa gcc aaa aaa tct gac ggc aca gca ggt aca acc acc aca gca Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Ala 1830 1835 1840	6236
ggg gca acc ggt acg gtt aaa ggc ttt gct gga caa acg gcg gtt ggt Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr Ala Val Gly 1845 1850 1855	6284
gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc cgt atc caa aat gtg Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile Gln Asn Val 1860 1865 1870 1875	6332
gca gca ggt gag gtc agt gcc acc agc acc gat gcg gtc aat ggt agc Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser 1880 1885 1890	6380
cag ttg tac aaa gcc acc caa agc att gcc aac gca acc aat gag ctt Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu 1895 1900 1905	6428
gac cat cgt atc cac caa aac gaa aat aag gcc aat gca ggg att tca Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser 1910 1915 1920	6476
tca gcg atg gcg atg gcg tcc atg cca caa gcc tac att cct ggc aga Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg 1925 1930 1935	6524
tcc atg gtt acc ggg ggt att gcc acc cac aac ggt caa ggt gcg gtg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val 1940 1945 1950 1955	6572
gca gtg gga ctg tcg aag ctg tcg gat aat ggt caa tgg gta ttt aaa Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys 1960 1965 1970	6620
atc aat ggt tca gcc gat acc caa ggc cat gta ggg gcg gca gtt ggt Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala Ala Val Gly 1975 1980 1985	6668
gca ggt ttt cac ttt taagccataa atcgcaagat tttacttaaa aatcaatctc Ala Gly Phe His Phe 1990	6723
accatagttg tataaaacag catcagcatc agtcatatta ctgatgctga tgtttttat 6783	
cacttaaacc attttaccgc tcaagtgatt ctctttcacc atgaccaaat cgccatttgat 6843	

cataggtaaa cttattgagt aaattttatc aatgtatgg ttagatatgg ttaaaattgt 6903
gccattgacc aaaaaatgac cgatttatcc cgaaaatttc tgattatgat ccgttgacct 6963
gcaggtcgac 6973

Figure 3. *M. catarrhalis* strain 4223 genomic 200kDa gene.

ccatggatat gggcaggtgt gctcgctgc cgtatgatgg cgatgacacc ccatttgc	60
cataatctgta cgatttgaca tgtgatatga tttaacatgt gacatgattt aacattgttt	120
aataactgttg ccatcattac cataatttag taacgcattt agtaacgcatt tgtaaaaaat	180
cattgcgcc ctttatgtgt atcatatgaa tagaatatta tgattgtatc tgattattgt	240
atcagaatgg tgatgctata tgatgatgcc tacgagttga tttgggtta tcactctatg	300
atttgatata ttttgaact aatctattga cttaaatcac catatggta taatttagca	360
taatggtagg cttttgtaa aaatcacatc gcaatattgt tctactgtta ctaccatgct	420
tgaatgacga tcccaatcac cagattcatt caagtgtatgt gtttgtatac gcaccattta	480
ccctaattat ttcaatcaa tgcctatgtc agcatgtatc attttttaa ggtaaaccac	540
 c atg aat cac atc tat aaa gtc atc ttt aac aaa gcc aca gca aca ttt	589
Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe	
1 5 10 15	
 atg gca gtg gca gag tac gcc aaa tcc cac agc acg <u>qqq qqq qgt</u> agc	637
Met Ala Val Ala Glu Tyr Ala Lys Ser His Ser Thr Gly Gly Ser	
20 25 30	
 tgt gct aca ggg caa gtt ggc agt gta tgc act ctg agc ttt gcc cgt	685
Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg	
35 40 45	
 att gcc gcg ctc gct gtc ctc gtg atc ggt gca acg ctc agt ggc agt	733
Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Ser Gly Ser	
50 55 60	
 gct tat gct caa aaa aaa gat acc aaa cat atc gca att ggt gaa caa	781
Ala Tyr Ala Gln Lys Lys Asp Thr Lys His Ile Ala Ile Gly Glu Gln	
65 70 75 80	
 aac cag cca aga cgc tca ggc act gcc aag gcg gac ggt gat cga gcc	829
Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys Ala Asp Gly Asp Arg Ala	
85 90 95	
 att gct att ggt gaa aat gct aac gca cag ggc ggt caa gcc atc gcc	877
Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln Gly Gly Gln Ala Ile Ala	
100 105 110	
 atc ggt agt aat aaa act gtc aat gga agc agt ttg gat aag ata	925
Ile Gly Ser Ser Asn Lys Thr Val Asn Gly Ser Ser Leu Asp Lys Ile	
115 120 125	
 ggt acc gat gct acg ggt caa gag tcc atc gcc atc ggt ggt gat gta	973
Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile Ala Ile Gly Gly Asp Val	
130 135 140	
 aag gct agt ggt gat gcc tcg att gcc atc ggt agt gat gac tta cat	1021
Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu His	

145	150	155	160	
ttg ctt gat cag cat ggt aat cct aaa cat ccg aaa ggt act ctg att Leu Leu Asp Gln His Gly Asn Pro Lys His Pro Lys Gly Thr Leu Ile 165	170	175		1069
aac gat ctt att aac ggc cat gca gta tta aaa gaa ata cga agc tca Asn Asp Leu Ile Asn Gly His Ala Val Leu Lys Glu Ile Arg Ser Ser 180	185	190		1117
aag gat aat gat gta aaa tat aga cgc aca acc gca agc gga cac gcc Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr Thr Ala Ser Gly His Ala 195	200	205		1165
agt act gca gtg gga gcc atg tca tat gca cag ggt cat ttt tcc aac Ser Thr Ala Val Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn 210	215	220		1213
gcc ttt ggt aca cgg gca aca gct aaa agt gcc tat tcc ttg gca gtg Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser Ala Tyr Ser Leu Ala Val 225	230	235	240	1261
ggt ctt gcc gcc aca gag ggc caa tct aca atc gct att ggt tct Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser Thr Ile Ala Ile Gly Ser 245	250	255		1309
gat gca aca tct agc tcg ttg gga gcg ata gcc ctt ggt gca ggt act Asp Ala Thr Ser Ser Leu Gly Ala Ile Ala Leu Gly Ala Gly Thr 260	265	270		1357
cgt gct cag cta cag ggc agt att gcc cta ggt caa ggt tct gtt gtc Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu Gly Gln Gly Ser Val Val 275	280	285		1405
act cag agt gat aat aat tct aga ccg gcc tat aca cca aat acc cag Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala Tyr Thr Pro Asn Thr Gln 290	295	300		1453
gca cta gac ccc aag ttt caa gcc acc aat aat acg aag gcg ggt cca Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn Asn Thr Lys Ala Gly Pro 305	310	315	320	1501
ctt tcc att ggt agt aac tct atc aaa cgt aaa atc atc aat gtc ggt Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg Lys Ile Ile Asn Val Gly 325	330	335		1549
gca ggt gtt aat aaa acc gat gcg gtc aat gtg gca cag cta gaa gcg Ala Gly Val Asn Lys Thr Asp Ala Val Asn Val Ala Gln Leu Glu Ala 340	345	350		1597
gtg gtg aag tgg gct aag gag cgt aga att act ttt cag ggt gat gat Val Val Lys Trp Ala Lys Glu Arg Arg Ile Thr Phe Gln Gly Asp Asp 355	360	365		1645
aac agt act gac gta aaa ata ggt ttg gat aat act tta act att aaa Asn Ser Thr Asp Val Lys Ile Gly Leu Asp Asn Thr Leu Thr Ile Lys 370	375	380		1693
ggt ggt gca gag acc aac gca tta acc gat aat aat atc ggt gtg gta				1741

Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp Asn Asn Ile Gly Val Val			
385	390	395	400
aaa gag gct gat aat agt ggt ctg aaa gtt aaa ctt gct aaa act tta			1789
Lys Glu Ala Asp Asn Ser Gly Leu Lys Val Lys Leu Ala Lys Thr Leu			
405	410	415	
aac aat ctt act gag gtg aat aca act aca tta aat gcc aca acc aca			1837
Asn Asn Leu Thr Glu Val Asn Thr Thr Leu Asn Ala Thr Thr Thr			
420	425	430	
gtt aag gta ggt agt agt agt act aca gct gaa tta ttg agt gat			1885
Val Lys Val Gly Ser Ser Ser Thr Thr Ala Glu Leu Leu Ser Asp			
435	440	445	
agt tta acc ttt acc cag ccc aat aca ggc agt caa agc aca agc aaa			1933
Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly Ser Gln Ser Thr Ser Lys			
450	455	460	
acc gtc tat ggc gtt aat ggg gtg aag ttt act aat aat gca gaa aca			1981
Thr Val Tyr Gly Val Asn Gly Val Lys Phe Thr Asn Asn Ala Glu Thr			
465	470	475	480
aca gca gca atc ggc act act cgt att acc aga gat aaa att ggc ttt			2029
Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr Arg Asp Lys Ile Gly Phe			
485	490	495	
gct cga gat ggt gat gtt gat gaa aaa caa gca cca tat ttg gat aaa			2077
Ala Arg Asp Gly Asp Val Asp Glu Lys Gln Ala Pro Tyr Leu Asp Lys			
500	505	510	
aaa caa ctt aaa gtg ggt agt gtt gca att acc ata gac aat ggc att			2125
Lys Gln Leu Lys Val Gly Ser Val Ala Ile Thr Ile Asp Asn Gly Ile			
515	520	525	
gat gca ggt aat aaa aag atc agt aat ctt gcc aaa ggt agc agt gct			2173
Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu Ala Lys Gly Ser Ser Ala			
530	535	540	
aac gat gcg gtt acc atc gaa cag ctc aaa gcc gcc aag cct act tta			2221
Asn Asp Ala Val Thr Ile Glu Gln Leu Lys Ala Ala Lys Pro Thr Leu			
545	550	555	560
aac gca ggc gct ggc atc agt gtc aca cct act gaa ata tca gtt gat			2269
Asn Ala Gly Ala Gly Ile Ser Val Thr Pro Thr Glu Ile Ser Val Asp			
565	570	575	
gct aag agt ggc aat gtt acc gcc cca act tac aac att ggc gtg aaa			2317
Ala Lys Ser Gly Asn Val Thr Ala Pro Thr Tyr Asn Ile Gly Val Lys			
580	585	590	
acc acc gag ctt aac agt gat ggc act agt gat aaa ttt agt gtt aag			2365
Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser Asp Lys Phe Ser Val Lys			
595	600	605	
ggt agt ggt acg aac aat agc tta gtt acc gcc gaa cat ttg gca agc			2413
Gly Ser Gly Thr Asn Asn Ser Leu Val Thr Ala Glu His Leu Ala Ser			
610	615	620	

tat cta aat gaa gtc aat cga acg gct gac agt gct cta caa agc ttt Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp Ser Ala Leu Gln Ser Phe 625 630 635 640	2461
acc gtt aaa gaa gaa gac gat gat gac gcc aac gct atc acc gtg gct Thr Val Lys Glu Glu Asp Asp Asp Ala Asn Ala Ile Thr Val Ala 645 650 655	2509
aaa gat acg aca aaa aat gcc ggc gca gtc agc atc tta aaa ctc aaa Lys Asp Thr Thr Lys Asn Ala Gly Ala Val Ser Ile Leu Lys Leu Lys 660 665 670	2557
ggg aaa aac ggt cta acg gtt gct acc aaa aaa gat ggt acg gtt acc Gly Lys Asn Gly Leu Thr Val Ala Thr Lys Lys Asp Gly Thr Val Thr 675 680 685	2605
ttt ggg ctt agc caa gat agc ggt ctg acc att ggc aaa agc acc cta Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr Ile Gly Lys Ser Thr Leu 690 695 700	2653
aac aac gat ggc ttg act gtt aaa gat acc aac gaa caa atc caa gtc Asn Asn Asp Gly Leu Thr Val Lys Asp Thr Asn Glu Gln Ile Gln Val 705 710 715 720	2701
ggg gct aat ggc att aaa ttt act aat gtg aat ggt agt aat cca ggt Gly Ala Asn Gly Ile Lys Phe Thr Asn Val Asn Gly Ser Asn Pro Gly 725 730 735	2749
act ggc att gca aat acc gct cgc att acc aga gat aaa att ggc ttt Thr Gly Ile Ala Asn Thr Ala Arg Ile Thr Arg Asp Lys Ile Gly Phe 740 745 750	2797
gct ggt tct gat ggt gca gtt gat aca aac aaa cct tat ctt gat caa Ala Gly Ser Asp Gly Ala Val Asp Thr Asn Lys Pro Tyr Leu Asp Gln 755 760 765	2845
gac aag cta caa gtt ggc aat gtt aag att acc aac act ggc att aac Asp Lys Leu Gln Val Gly Asn Val Lys Ile Thr Asn Thr Gly Ile Asn 770 775 780	2893
gca ggt ggt aaa gcc atc aca ggg ctg tcc cca aca ctg cct agc att Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser Pro Thr Leu Pro Ser Ile 785 790 795 800	2941
gcc gat caa agt agc cgc aac ata gaa ctg ggc aat aca atc caa gac Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu Gly Asn Thr Ile Gln Asp 805 810 815	2989
aaa gac aaa tcc aac gct gcc agc att aat gat ata tta aat aca ggc Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn Asp Ile Leu Asn Thr Gly 820 825 830	3037
ttt aac cta aaa aat aat aac aac ccc att gac ttt gtc tcc act tat Phe Asn Leu Lys Asn Asn Asn Pro Ile Asp Phe Val Ser Thr Tyr 835 840 845	3085
gac att gtt gac ttt gcc aat ggc aat gcc acc acc gcc aca gta acc Asp Ile Val Asp Phe Ala Asn Gly Asn Ala Thr Thr Ala Thr Val Thr 850 855 860	3133

09859219-1226

cat gat acc gct aac aaa acc agt aaa gtg gta tat gat gtg aat gtg His Asp Thr Ala Asn Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val 865 870 875 880	3181
gat gat aca acc att cat cta aca ggc act gat gac aat aaa aaa ctt Asp Asp Thr Thr Ile His Leu Thr Gly Thr Asp Asp Asn Lys Lys Leu 885 890 895	3229
ggc gtc aaa acc acc aaa ctg aac aaa aca agt gct aat ggt aat aca Gly Val Lys Thr Thr Lys Leu Asn Lys Thr Ser Ala Asn Gly Asn Thr 900 905 910	3277
gca act aac ttt aat gtt aac tct agt gat gaa gat gcc ctt gtt aac Ala Thr Asn Phe Asn Val Asn Ser Ser Asp Glu Asp Ala Leu Val Asn 915 920 925	3325
gcc aaa gac atc gcc gaa aat cta aac acc cta gcc aag gaa att cac Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His 930 935 940	3373
acc acc aaa ggc aca gca gac acc gcc cta caa acc ttt acc gtt aaa Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Thr Val Lys 945 950 955 960	3421
aag gta gat gaa aat aat aat gct gat gac gcc aac gcc atc acc gtg Lys Val Asp Glu Asn Asn Ala Asp Asp Ala Asn Ala Ile Thr Val 965 970 975	3469
ggt caa aag aac gca aat aat caa gtc aac acc cta aca ctc aaa ggt Gly Gln Lys Asn Ala Asn Asn Gln Val Asn Thr Leu Thr Leu Lys Gly 980 985 990	3517
gaa aac ggt ctt aat att aaa acc gac aaa aat ggt acg gtt acc ttt Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys Asn Gly Thr Val Thr Phe 995 1000 1005	3565
ggc att aac acc aca agc ggt ctt aaa gcc ggc aaa agc acc cta aac Gly Ile Asn Thr Ser Gly Leu Lys Ala Gly Lys Ser Thr Leu Asn 1010 1015 1020	3613
gac ggt ggc ttg tct att aaa aac ccc act ggt agc gaa caa atc caa Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly Ser Glu Gln Ile Gln 1025 1030 1035 1040	3661
gtc ggt gct gat ggc gtg aag ttt gcc aag gtt aat aat aat ggt gtt Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val Asn Asn Gly Val 1045 1050 1055	3709
gta ggt gct ggc att gat ggc aca act cgc att acc aga gat gaa att Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile Thr Arg Asp Glu Ile 1060 1065 1070	3757
ggc ttt act ggg act aat ggc tca ctt gat aaa agc aaa ccc cac cta Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys Ser Lys Pro His Leu 1075 1080 1085	3805
agc aaa gac ggc att aac gca ggt ggt aaa aag att acc aac att caa Ser Lys Asp Gly Ile Asn Ala Gly Lys Lys Ile Thr Asn Ile Gln	3853

1090

1095

1100

tca ggt gag att gcc caa aac agc cat gat gct gtg aca ggc ggc aag Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala Val Thr Gly Gly Lys 1105	1110	1115	1120	3901
att tat gat tta aaa acc gaa ctt gaa aac aaa atc agc agt act gcc Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys Ile Ser Ser Thr Ala 1125	1130	1135		3949
aaa aca gca caa aac tca tta cac gaa ttc tca gta gca gat gaa caa Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser Val Ala Asp Glu Gln 1140	1145	1150		3997
ggt aat aac ttt acg gtt agt aac cct tac tcc agt tat gac acc tca Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser Ser Tyr Asp Thr Ser 1155	1160	1165		4045
aag acc tct gat gtc atc acc ttt gca ggt gaa aac ggc att acc acc Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu Asn Gly Ile Thr Thr 1170	1175	1180		4093
aag gta aat aaa ggt gtg gtg cgt gtg ggc att gac caa acc aaa ggc Lys Val Asn Lys Gly Val Val Arg Val Gly Ile Asp Gln Thr Lys Gly 1185	1190	1195	1200	4141
tta acc acg cct aag ctg acc gtg ggt aat aat aat ggc aaa ggc att Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn Asn Gly Lys Gly Ile 1205	1210	1215		4189
gtc att gac agc caa aat ggt caa aat acc atc aca gga cta agc aac Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile Thr Gly Leu Ser Asn 1220	1225	1230		4237
act cta gct aat gtt acc aat gat aaa ggt agc gta cgc acc aca gaa Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser Val Arg Thr Thr Glu 1235	1240	1245		4285
cag ggc aat ata atc aaa gac gaa gac aaa acc cgt gcc gcc agc att Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr Arg Ala Ala Ser Ile 1250	1255	1260		4333
gtt gat gtg cta agc gca ggc ttt aac ttg caa ggc aat ggt gaa gcg Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln Gly Asn Gly Glu Ala 1265	1270	1275	1280	4381
gtt gac ttt gtc tcc act tat gac acc gtc aac ttt gcc gat ggc aat Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn Phe Ala Asp Gly Asn 1285	1290	1295		4429
gcc acc acc gct aag gtg acc tat gat gac aca agc aaa acc agt aaa Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr Ser Lys Thr Ser Lys 1300	1305	1310		4477
gtg gtc tat gat gtc aat gtg gat gat aca acc att gaa gtt aaa gat Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile Glu Val Lys Asp 1315	1320	1325		4525
aaa aaa ctt ggc gta aaa acc acc aca ttg acc agt act ggc aca ggt				4573

Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr Ser Thr Gly Thr Gly
1330 1335 1340

gct aat aaa ttt gcc cta agc aat caa gct act ggc gat gcg ctt gtc 4621
Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr Gly Asp Ala Leu Val
1345 1350 1355 1360

aag gcc agt gat atc gtt gct cat cta aac acc tta tct ggc gac atc 4669
Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr Leu Ser Gly Asp Ile
1365 1370 1375

caa act gcc aaa ggg gca agc caa gcg aac aac tca gca ggc tat gtg 4717
Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn Ser Ala Gly Tyr Val
1380 1385 1390

gat gct gat ggc aat aag gtc atc tat gac agt acc gat aac aag tac 4765
Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser Thr Asp Asn Lys Tyr
1395 1400 1405

tat caa gcc aaa aat gat ggc aca gtt gat aaa acc aaa gaa gtt gcc 4813
Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys Thr Lys Glu Val Ala
1410 1415 1420

aaa gac aaa ctg gtc gcc caa gcc caa acc cca gat ggc aca ttg gct 4861
Lys Asp Lys Leu Val Ala Gln Ala Thr Pro Asp Gly Thr Leu Ala
1425 1430 1435 1440

caa atg aat gtc aaa tca gtc att aac aaa gaa caa gta aat gat gcc 4909
Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu Gln Val Asn Asp Ala
1445 1450 1455

aat aaa aag caa ggc atc aat gaa gac aac gcc ttt gtt aaa gga ctt 4957
Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala Phe Val Lys Gly Leu
1460 1465 1470

gaa aaa gcc gct tct gat aac aaa acc aaa aac gcc gca gta act gtg 5005
Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn Ala Ala Val Thr Val
1475 1480 1485

ggt gat tta aat gcc gtt gcc caa aca ccg ctg acc ttt gca ggg gat 5053
Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu Thr Phe Ala Gly Asp
1490 1495 1500

aca ggc aca acg gct aaa aaa ctg ggc gag act ttg acc atc aaa ggt 5101
Thr Gly Thr Ala Lys Lys Leu Gly Glu Thr Leu Thr Ile Lys Gly
1505 1510 1515 1520

ggg caa aca gac acc aat aag cta acc gat aat aac atc ggt gtg gta 5149
Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn Asn Ile Gly Val Val
1525 1530 1535

gca ggt act gat ggc ttc act gtc aaa ctt gcc aaa gac cta acc aat 5197
Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala Lys Asp Leu Thr Asn
1540 1545 1550

ctt aac agc gtt aat gca ggt ggc acc aaa att gat gac aaa ggc gtg 5245
Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile Asp Asp Lys Gly Val
1555 1560 1565

DRAFT

tct ttt gta gac tca agc ggt caa gcc aaa gca aac acc acc cct gtg cta Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala Asn Thr Pro Val Leu 1570 1575 1580	5293
agt gcc aat ggg ctg gac ctg ggt ggc aag gtc atc agt aat gtg ggc Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val Ile Ser Asn Val Gly 1585 1590 1595 1600	5341
aaa ggc aca aaa gat acc gac gct gcc aat gta caa cag tta aac gaa Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu 1605 1610 1615	5389
gta cgc aac ttg ttg ggt ctt ggt aat gct ggt aat gat aac gct gac Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly Asn Asp Asn Ala Asp 1620 1625 1630	5437
ggc aat cag gta aac att gcc gac atc aaa aaa gac cca aat tca ggt Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly 1635 1640 1645	5485
tca tca tct aac cgc act gtc atc aaa gca ggc acg gta ctt ggc ggt Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly 1650 1655 1660	5533
aaa ggt aat aac gat acc gaa aaa ctt gcc act ggt ggt ata caa gtg Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr Gly Gly Ile Gln Val 1665 1670 1675 1680	5581
ggc gtg gat aaa gac ggc aac gct aac ggc gat tta agc aat gtt tgg Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp 1685 1690 1695	5629
gtc aaa acc caa aaa gat ggc agc aaa aaa gcc ctg ctc gcc act tat Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr 1700 1705 1710	5677
aac gcc gca ggt cag acc aac tat ttg acc aac aac ccc gca gaa gcc Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala 1715 1720 1725	5725
att gac aga ata aat gaa caa ggt atc cgc ttc ttc cat gtc aac gat Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp 1730 1735 1740	5773
ggc aat caa gag cct gtg gta caa ggg cgt aac ggc att gac tca agt Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser 1745 1750 1755 1760	5821
gcc tca ggc aag cac tca gtg gcg ata ggt ttc cag gcc aag gca gat Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe Gln Ala Lys Ala Asp 1765 1770 1775	5869
ggt gaa gcc gcc gtt gcc ata ggc aga caa acc caa gca ggc aac caa Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr Gln Ala Gly Asn Gln 1780 1785 1790	5917
tcc atc gcc atc ggt gat aac gca caa gcc acg ggc gat caa tcc atc Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala Thr Gly Asp Gln Ser Ile 1795 1800 1805	5965

gcc atc ggt aca ggc aat gtg gta gca ggt aag cac tct ggt gcc atc Ala Ile Gly Thr Gly Asn Val Val Ala Gly Lys His Ser Gly Ala Ile	1810 1815 1820	6013
ggc gac cca agc act gtt aag gct gat aac agt tac agt gtg ggt aat Gly Asp Pro Ser Thr Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn	1825 1830 1835 1840	6061
aac aac cag ttt acc gat gcc actcaa acc gat gtc ttt ggt gtg ggc Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly	1845 1850 1855	6109
aat aac atc acc gtg acc gaa agt aac tcg gtt gcc tta ggt tca aac Asn Asn Ile Thr Val Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn	1860 1865 1870	6157
tct gcc atc agt gca ggc aca cac gca ggc aca caa gcc aaa aaa tct Ser Ala Ile Ser Ala Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser	1875 1880 1885	6205
gac ggc aca gca ggt aca acc acc aca gca ggt gca acc ggt acg gtt Asp Gly Thr Ala Gly Thr Thr Ala Gly Ala Thr Gly Thr Val	1890 1895 1900	6253
aaa ggc ttt gct gga caa acg gcg gtt ggt gcg gtc tcc gtg ggt gcc Lys Gly Phe Ala Gly Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala	1905 1910 1915 1920	6301
tca ggt gct gaa cgc cgt atc caa aat gtg gca gca ggt gag gtc agt Ser Gly Ala Glu Arg Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser	1925 1930 1935	6349
gcc acc agc acc gat gcg gtc aat ggt agc cag ttg tac aaa gcc acc Ala Thr Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr	1940 1945 1950	6397
caa agc att gcc aac gca acc aat gag ctt gac cat cgt atc cac caa Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu Asp His Arg Ile His Gln	1955 1960 1965	6445
aac gaa aat aag gcc aat gca ggg att tca tca gcg atg gcg atg gcg Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala	1970 1975 1980 1980	6493
tcc atg cca caa gcc tac att cct ggc aga tcc atg gtt acc ggg ggt Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Gly	1985 1990 1995 2000	6541
att gcc acc cac aac ggt caa ggt gcg gtg gca gtg gga ctg tcg aag Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys	2005 2010 2015	6589
ctg tcg gat aat ggt caa tgg gta ttt aaa atc aat ggt tca gcc gat Leu Ser Asp Asn Gly Gln Trp Val Phe Lys Ile Asn Gly Ser Ala Asp	2020 2025 2030	6637
acc caa ggc cat gta ggg gcg gca gtt ggt gca ggt ttt cac ttt Thr Gln Gly His Val Gly Ala Ala Val Gly Ala Gly Phe His Phe		6682

2035

2040

2045

taagccataa atcgcaagat tttacttaaa aatcaatctc accatagttg tataaaacag 6742
catcagcatc agtcataatta ctgatgctga tgtttttat cacttaaacc attttaccgc 6802
tcaagtgatt ctcttcacc atgaccaaat cgccattgat cataggtaaa cttattgagt 6862
aaatttatc aatgttagttg ttagatatgg ttaaaaattgt gccattgacc aaaaaatgac 6922
cgatttatcc cgaaaatttc tgattatgat ccgttgacct gcaggtcgac 6972

Figure 4. *M. catarrhalis* strain Q8 200kDa gene

ATG aat cac atc tat aaa gtc atc ttt aac aaa gcc aca ggc aca ttt Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe	1 5 10 15	48
atg gcc gtg gcg gaa tat gcc aaa tcc cac agt acg <u>ggg ggg ggt</u> agc Met Ala Val Ala Glu Tyr Ala Lys Ser His Ser Thr Gly Gly Ser	20 25 30	96
tgt gct aca ggg caa gtt ggc agt gta cgcc act cta agc ttt gcc cgt Cys Ala Thr Gly Gln Val Gly Ser Val Arg Thr Leu Ser Phe Ala Arg	35 40 45	144
att gcc gcg ctc gct gtc ctc gtg atc ggt gcg acg ctc aat ggc agt Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Asn Gly Ser	50 55 60	192
gct tat gct caa caa att act acc aag atc gaa att ggt caa aca aac Ala Tyr Ala Gln Gln Ile Thr Thr Lys Ile Glu Ile Gly Gln Thr Asn	65 70 75 80	240
aag ata aac aac acg ctg aaa ggc gat gcc cta gcg aca ggt gaa gca Lys Ile Asn Asn Thr Leu Lys Gly Asp Ala Leu Ala Thr Gly Glu Ala	85 90 95	288
tcc att gct ttt ggt agt ctt tct aag gca caa ggc tct caa gct att Ser Ile Ala Phe Gly Ser Leu Ser Lys Ala Gln Gly Ser Gln Ala Ile	100 105 110	336
gct atc ggt agt gtc aaa cca gat cct aat aat ggt agt aat ggt aat Ala Ile Gly Ser Val Lys Pro Asp Pro Asn Asn Gly Ser Asn Gly Asn	115 120 125	384
gta ggt tcc cac gcc aaa ggt aac gag tcc atc gcc atc ggt ggt gat Val Gly Ser His Ala Lys Gly Asn Glu Ser Ile Ala Ile Gly Gly Asp	130 135 140	432
gta ttg gct gag ggt gat gcc tcg att gcc atc ggt agt gat gac tta Val Leu Ala Glu Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu	145 150 155 160	480
tat ttg cct aag aat ctt gat ctg aag aat gaa ttt cac aaa ctt att Tyr Leu Pro Lys Asn Leu Asp Leu Lys Asn Glu Phe His Lys Leu Ile	165 170 175	528
cat ggc cat gaa ata tta aaa aaa ata caa acc tca acc gat ggt aaa His Gly His Glu Ile Leu Lys Lys Ile Gln Thr Ser Thr Asp Gly Lys	180 185 190	576
atc aaa tat cga cgc aca aga gca caa ggg cac gcc agt act gca gtg Ile Lys Tyr Arg Arg Thr Arg Ala Gln Gly His Ala Ser Thr Ala Val	195 200 205	624
gga gcc atg tca tat gca cag ggt cat ttt tcc aac gcc ttt ggt aca Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr	210 215 220	672

tac gca aca gct gaa gct gcc tat tcc ttg gca gta ggt ctt gcc gcc		720
Tyr Ala Thr Ala Glu Ala Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala		
225	230	235
240		
caa gcc aca aaa caa tct tca atc gct gtt ggt tcc aat gca aaa gct		768
Gln Ala Thr Lys Gln Ser Ser Ile Ala Val Gly Ser Asn Ala Lys Ala		
245	250	255
aac gcg ttt gca gcg aca gcc att ggt gga aat act gta gtt aat ttg		816
Asn Ala Phe Ala Ala Thr Ala Ile Gly Gly Asn Thr Val Val Asn Leu		
260	265	270
ggt cga ggc gtt gcc cta ggt ttt ggt tct cag atc ctt gat agg gat		864
Gly Arg Gly Val Ala Leu Gly Phe Gly Ser Gln Ile Leu Asp Arg Asp		
275	280	285
aat aat aca gat gcc agt gcc tat gta cca cta ggt aaa acg tta gca		912
Asn Asn Thr Asp Ala Ser Ala Tyr Val Pro Leu Gly Lys Thr Leu Ala		
290	295	300
gac cag tat aaa gcc acc cgc cag ggt gat tct acg gat ata ttt tcc		960
Asp Gln Tyr Lys Ala Thr Arg Gln Gly Asp Ser Thr Asp Ile Phe Ser		
305	310	315
320		
att ggt aat agt aat aat aat agc agt atc agg cgt aaa atc atc		1008
Ile Gly Asn Ser Asn Asn Asn Ser Ser Ile Arg Arg Lys Ile Ile		
325	330	335
aat gtc ggt gcg ggt tct cgg gat acc gat gcg gtc aat gtg gca cag		1056
Asn Val Gly Ala Gly Ser Arg Asp Thr Asp Ala Val Asn Val Ala Gln		
340	345	350
ctt aaa ttg gtg gag gaa ctg gct aat cgt aaa att act ttt aag ggt		1104
Leu Lys Leu Val Glu Leu Ala Asn Arg Lys Ile Thr Phe Lys Gly		
355	360	365
gat ggt gac aat aat agc aat agc gta gaa aga ggt ttg ggc aat act		1152
Asp Gly Asp Asn Asn Ser Asn Ser Val Glu Arg Gly Leu Gly Asn Thr		
370	375	380
tta act att aaa ggt gat gca cag acc aac gca tta acc gaa gct aac		1200
Leu Thr Ile Lys Gly Asp Ala Gln Thr Asn Ala Leu Thr Glu Ala Asn		
385	390	395
400		
atc ggt gtg gta aca gat ggc aat ggt ctg aaa gtt aaa ctt gct aaa		1248
Ile Gly Val Val Thr Asp Gly Asn Gly Leu Lys Val Lys Leu Ala Lys		
405	410	415
gag ctg act gga ttg acc agt gtc tcc gct acc aac aaa atc acc gtt		1296
Glu Leu Thr Gly Leu Thr Ser Val Ser Ala Thr Asn Lys Ile Thr Val		
420	425	430
445		
agt aat acc aac aac aac gcc gag cta caa agc ggt ggt ttg acc		1344
Ser Asn Thr Asn Asn Asn Ala Glu Leu Gln Ser Gly Gly Leu Thr		
435	440	445
ttt agc cca ata aca ggt aca aaa aca gat aaa acc gtc tac agc att		1392
Phe Ser Pro Ile Thr Gly Thr Lys Thr Asp Lys Thr Val Tyr Ser Ile		
450	455	460

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gat gga ttg aag ttt act aat gat agt aat gat gca act aaa ggt Asp Gly Leu Lys Phe Thr Asn Asp Ser Asn Ser Ile Ala Thr Lys Gly 465 470 475 480	1440
act act cgt att acc aaa aag aaa att ggt ttt gct ggt act aat gat Thr Thr Arg Ile Thr Lys Lys Ile Gly Phe Ala Gly Thr Asn Asp 485 490 495	1488
gga gtt gat gaa agc aaa cct tat ctt gac aac gaa aag cta aaa gtt Gly Val Asp Glu Ser Lys Pro Tyr Leu Asp Asn Glu Lys Leu Lys Val 500 505 510	1536
ggc aac agc acc cta aac agt ggt agc ttg act gtt aat aac acc act Gly Asn Ser Thr Leu Asn Ser Gly Ser Leu Thr Val Asn Asn Thr Thr 515 520 525	1584
ggt aat aaa caa atc caa gtc ggt gct aat ggc att aaa ttt gcc aca Gly Asn Lys Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe Ala Thr 530 535 540	1632
gtc gct aat aat gtt gca aat acc tca gca aca gtc ggc act gct cgt Val Ala Asn Asn Val Ala Asn Thr Ser Ala Thr Val Gly Thr Ala Arg 545 550 555 560	1680
att acc gaa gag aaa att ggt ttt gct ggt act aat gat gga gtt gat Ile Thr Glu Glu Lys Ile Gly Phe Ala Gly Thr Asn Asp Gly Val Asp 565 570 575	1728
gaa caa gca cca tat ttg gat aaa gaa cga ctt aaa gtg ggt cgt gtt Glu Gln Ala Pro Tyr Leu Asp Lys Glu Arg Leu Lys Val Gly Arg Val 580 585 590	1776
gaa att acc aca gat agt ggt att aat gct ggt aat cac aag att acc Glu Ile Thr Thr Asp Ser Gly Ile Asn Ala Gly Asn His Lys Ile Thr 595 600 605	1824
gga ctt act aat ggt ata gca aat acc gat gcg gtt acc atc aaa cag Gly Leu Thr Asn Gly Ile Ala Asn Thr Asp Ala Val Thr Ile Lys Gln 610 615 620	1872
ctc aaa gac gcc aag cct act tta aac gca ggc gat ggc atc agt att Leu Lys Asp Ala Lys Pro Thr Leu Asn Ala Gly Asp Gly Ile Ser Ile 625 630 635 640	1920
aat agt aat aac ggg gat cta gtt gat agt agt ggc aat att acc acc Asn Ser Asn Asn Gly Asp Leu Val Asp Ser Ser Gly Asn Ile Thr Thr 645 650 655	1968
cca act tat aac att agc gtg aaa acc act aag ctt aac agt aat ggc Pro Thr Tyr Asn Ile Ser Val Lys Thr Thr Lys Leu Asn Ser Asn Gly 660 665 670	2016
acc agt ggt aat aat aaa ttt agt gtt agt aat gct cat gat aac aat Thr Ser Gly Asn Asn Lys Phe Ser Val Ser Asn Ala His Asp Asn Asn 675 680 685	2064
agc tta gtt acc gcc aaa gat ttg gca gac tat cta aat aaa gtc aat Ser Leu Val Thr Ala Lys Asp Leu Ala Asp Tyr Leu Asn Lys Val Asn	2112

690

695

700

gaa acg gct gac agt gct cta cca agc ttt aaa gtc caa aac ggt gat Glu Thr Ala Asp Ser Ala Leu Pro Ser Phe Lys Val Gln Asn Gly Asp 705	710	715	720	2160
aat agc aac aac gcc atc acc gtg ggt aaa gat aca aac ggc aag acc Asn Ser Asn Asn Ala Ile Thr Val Gly Lys Asp Thr Asn Gly Lys Thr 725	730	735		2208
ttc aac acc tta aaa ctc aaa ggt gaa aac ggt gtt aat att acg acc Phe Asn Thr Leu Lys Leu Lys Gly Glu Asn Gly Val Asn Ile Thr Thr 740	745	750		2256
aat aga gcc aca ggt aca gtt acc ttt ggc att gac caa agt aat ggt Asn Arg Ala Thr Gly Thr Val Thr Phe Gly Ile Asp Gln Ser Asn Gly 755	760	765		2304
ctc acc acg cct aag ctg acc gtg ggt agc gat aca aat ggt aat cga Leu Thr Thr Pro Lys Leu Thr Val Gly Ser Asp Thr Asn Gly Asn Arg 770	775	780		2352
ttg gtt att gag caa gtc cct agc gct gac ggt aac agc acc aaa aac Leu Val Ile Glu Gln Val Pro Ser Ala Asp Gly Asn Ser Thr Lys Asn 785	790	795	800	2400
atc att aaa gga ttg tcc cca aca ctg cct agc att gcc agt cca agt Ile Ile Lys Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Ser Pro Ser 805	810	815		2448
ggc cgc aac ata gca ctg ggc aat aca atc gaa gaa aaa gac aaa tcc Gly Arg Asn Ile Ala Leu Gly Asn Thr Ile Glu Glu Lys Asp Lys Ser 820	825	830		2496
aac gct gcc agc att gat gat gtg cta aat gca ggc ttt aac cta aaa Asn Ala Ala Ser Ile Asp Asp Val Leu Asn Ala Gly Phe Asn Leu Lys 835	840	845		2544
aat aat ggc aaa gac aaa gac ttt gtc tcc act tat gac act gtt gac Asn Asn Gly Lys Asp Lys Asp Phe Val Ser Thr Tyr Asp Thr Val Asp 850	855	860		2592
ttt atc gat ggc aat gcc acc acc gcc aca gta act tat gat gaa gcc Phe Ile Asp Gly Asn Ala Thr Thr Ala Thr Val Thr Tyr Asp Glu Ala 865	870	875	880	2640
aat caa acc agt aaa gtg gcg tat gat gtg aat gtg gat gag aaa acc Asn Gln Thr Ser Lys Val Ala Tyr Asp Val Asn Val Asp Glu Lys Thr 885	890	895		2688
att gaa ctg aca ggc gat aat ggc aag aaa caa ctt ggc gtc aaa acc Ile Glu Leu Thr Gly Asp Asn Gly Lys Lys Gln Leu Gly Val Lys Thr 900	905	910		2736
atc aaa ctg acc gaa aca agt act aat ggt aat gca act aca ttt agt Ile Lys Leu Thr Glu Thr Ser Thr Asn Gly Asn Ala Thr Thr Phe Ser 915	920	925		2784
acc gac gat gac cat gcc ctt gtt aaa gcc agt gat atc gcc ggc aat				2832

Thr Asp Asp Asp His Ala Leu Val Lys Ala Ser Asp Ile Ala Gly Asn			
930	935	940	
ctc aac acc cta gcc gag gaa att cac acc acc aaa ggc aca gca aac			2880
Leu Asn Thr Leu Ala Glu Glu Ile His Thr Thr Lys Gly Thr Ala Asn			
945	950	955	960
acc gcc cta caa acc ttt acc gtt aaa aag gta gat gaa aat gat aag			2928
Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asp Lys			
965	970	975	
gct gat gac acc aac gcc atc acc gtg ggt aaa gat ggc aca agt ggt			2976
Ala Asp Asp Thr Asn Ala Ile Thr Val Gly Lys Asp Gly Thr Ser Gly			
980	985	990	
aaa gtc aac acc tta aaa ctc aaa ggt aaa aac ggt ctt gat att aaa			3024
Lys Val Asn Thr Leu Lys Leu Lys Gly Lys Asn Gly Leu Asp Ile Lys			
995	1000	1005	
acc gac aaa gat ggt acg gtt acc ttt ggc att aac acc caa agc ggt			3072
Thr Asp Lys Asp Gly Thr Val Thr Phe Gly Ile Asn Thr Gln Ser Gly			
1010	1015	1020	
ctt aaa gcc ggc gac agc acc act cta aac aac aat ggc ttg tct att			3120
Leu Lys Ala Gly Asp Ser Thr Thr Leu Asn Asn Asn Gly Leu Ser Ile			
1025	1030	1035	1040
aaa aac acc gct agt aac gaa caa atc caa gtc ggt gct gat ggc gtg			3168
Lys Asn Thr Ala Ser Asn Glu Gln Ile Gln Val Gly Ala Asp Gly Val			
1045	1050	1055	
aag ttt gcc atg gtt aat aat ggt gtt gta ggt gct ggc att gat ggc			3216
Lys Phe Ala Met Val Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly			
1060	1065	1070	
aca act cgc att acc aga gat gaa att ggc ttt act ggg act aat ggc			3264
Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly			
1075	1080	1085	
tca ctt gat aaa agc aaa ccc cac cta agc aaa gac ggc att aac gca			3312
Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala			
1090	1095	1100	
ggg ggt aaa aag att acc aac att caa tca ggt gag att gcc aaa aac			3360
Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Lys Asn			
1105	1110	1115	1120
agc cat gat gct gtg aca ggc ggc aag att tat gat tta aaa acc gaa			3408
Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu			
1125	1130	1135	
ctt gaa aat aaa atc agc agt act gcc aaa aca gca caa aac tca tta			3456
Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu			
1140	1145	1150	
cac gaa ttc tca gta gca gat gaa caa ggt aat aac ttt acg gtt agt			3504
His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser			
1155	1160	1165	

aac cct tac tcc agt tat gac acc tca aag acc tct gat gtc atc acc Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr 1170 1175 1180	3552
ttt gca ggt gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val 1185 1190 1195 1200	3600
cgt gtg ggc att gac caa acc aaa ggc tta acc acg cct aag ctg acc Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr 1205 1210 1215	3648
gtg ggt aat aat aat ggc aaa ggc att gtc att aac agc caa aat ggt Val Gly Asn Asn Gly Lys Gly Ile Val Ile Asn Ser Gln Asn Gly 1220 1225 1230	3696
caa aat acc atc aca gga cta agc aac act cta gct aat gtt acc aat Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn 1235 1240 1245	3744
gat aaa ggt agc gta cgc acc aca gaa cag ggc aat ata atc aaa gac Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp 1250 1255 1260	3792
gaa gac aaa acc cgt gcc gcc agc att gtt gat gtg cta agc gca ggc Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly 1265 1270 1275 1280	3840
ttt aac ttg caa ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr 1285 1290 1295	3888
gac acc gtc aac ttt gcc aat ggc aat acc acc acc gct aag gtg acc Asp Thr Val Asn Phe Ala Asn Gly Asn Thr Thr Ala Lys Val Thr 1300 1305 1310	3936
tat gat gac aca agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val 1315 1320 1325	3984
gat gat aca acc att gaa gtt aaa gat aaa aaa ctt ggc gta aaa acc Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr 1330 1335 1340	4032
acc aca ttg acc agt act ggc aca ggt gct aat aaa ttt gcc cta agc Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser 1345 1350 1355 1360	4080
aat caa gct act ggc gat gcg ctt gtc aag gcc agt gat atc gtt gct Asn Gln Ala Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala 1365 1370 1375	4128
cat cta aac acc tta tct ggc gac atc caa act gcc aaa ggg gca agc His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser 1380 1385 1390	4176
caa gcg aac aac tca gca ggc tat gtg gat gct gat ggc aat aag gtc Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val 1395 1400 1405	4224

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atc tat gac agt acc gat aac aag tac tat caa gcc aaa aat gat ggc Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly 1410 1415 1420	4272
aca gtt gat aaa acc aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln 1425 1430 1435 1440	4320
gcc caa acc cca gat ggc aca ttg gct caa atg aat gtc aaa tca gtc Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val 1445 1450 1455	4368
att aac aaa gaa caa gta aat gat gcc aat aaa aag caa ggc atc aat Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Gln Gly Ile Asn 1460 1465 1470	4416
gaa gac aac gcc ttt gtt aaa gga ctt gaa aaa gcc gct tct gat aac Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn 1475 1480 1485	4464
aaa acc aaa aac gcc gca gta act gtg ggt gat tta aat gcc gtt gcc Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala 1490 1495 1500	4512
caa aca ccg ctg acc ttt gca ggg gat aca ggc aca acg gct aaa aaa Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Ala Lys Lys 1505 1510 1515 1520	4560
ctg ggc gag act ttg acc atc aaa ggt ggg caa aca gac acc aat aag Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys 1525 1530 1535	4608
cta acc gat aat aac atc ggt gtg gta gca ggt act gat ggc ttc act Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr 1540 1545 1550	4656
gtc aaa ctt gcc aaa gac cta acc aat ctt aac agc gtt aat gca ggt Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly 1555 1560 1565	4704
ggc acc aaa att gat gaa aaa ggc atc tct ttt gta gac gca aac ggt Gly Thr Lys Ile Asp Glu Lys Gly Ile Ser Phe Val Asp Ala Asn Gly 1570 1575 1580	4752
caa gcc aaa gca aac acc cct gtg cta agt gcc aat ggg ctg gac ctg Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu 1585 1590 1595 1600	4800
ggt ggc aag gtc atc agt aat gtg ggc aaa ggc aca aaa gat acc gac Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp 1605 1610 1615	4848
gct gcc aat gta caa cag tta aac gaa gta cgc aac ttg ttg ggt ctt Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu 1620 1625 1630	4896
ggt aat gat aac gct gac ggc aat cag gta aac att gcc gac atc aaa Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys	4944

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1635

1640

1645

aaa gac cca aat tca ggt tca tca tct aac cgc act gtc atc aaa gca Lys Asp Pro Asn Ser Gly Ser Ser Asn Arg Thr Val Ile Lys Ala	1650	1655	1660	4992	
ggc acg gta ctt ggc ggt aaa ggt aat aac gat acc gaa aaa ctt gcc Gly Thr Val Leu Gly Gly Lys Asn Asn Asp Thr Glu Lys Leu Ala	1665	1670	1675	5040	
act ggt ggt gta caa gtg ggc gtg gat aaa gac ggc aac gct aac ggc Thr Gly Gly Val Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly	1685	1690	1695	5088	
gat tta agc aat gtt tgg gtc aaa acc caa aaa gat ggc agc aaa aaa Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys	1700	1705	1710	5136	
gcc ctg ctc gcc act tat aac gcc gca ggt cag acc aac tat gtg acc Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Val Thr	1715	1720	1725	5184	
aac aac ccc gca gaa gcc att gac aga ata aat gaa caa ggt atc cgc Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg	1730	1735	1740	5232	
ttc ttc cat gtc aac gat ggc aat caa gag cct gtg gta caa ggg cgt Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg	1745	1750	1755	1760	5280
aac ggc att gac tca agt gcc tca ggc aag cac tca gtg gcg ata ggt Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly	1765	1770	1775	5328	
ttc cag gcc aag gca gat ggt gaa gcc gcc gtt gcc ata ggc aga caa Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln	1780	1785	1790	5376	
acc caa gca ggc aac caa tcc atc gcc atc ggt gat aac gca caa gcc Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala	1795	1800	1805	5424	
acg ggc gat caa tcc atc gcc atc ggt aca ggc aat gtg gta gca ggt Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly	1810	1815	1820	5472	
aag cac tct ggt gcc atc ggc gac cca agc act gtt aag gct gat aac Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn	1825	1830	1835	1840	5520
agt tac agt gtg ggt aat aac aac cag ttt acc gat gcc act caa acc Ser Tyr Ser Val Gly Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr	1845	1850	1855	5568	
gat gtc ttt ggt gtg ggc aat aac atc acc gtg acc gaa agt aac tcg Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu Ser Asn Ser	1860	1865	1870	5616	
gtt gcc tta ggt tca aac tct gcc atc agt gca ggc aca cac gca ggc				5664	

Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly
 1875 1880 1885

aca caa gcc aaa aaa tct gac ggc aca gca ggt aca acc acc aca gca 5712
 Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Ala
 1890 1895 1900

ggt gcc aca ggt acg gtt aaa ggc ttt gct gga caa acg gcg gtt ggt 5760
 Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr Ala Val Gly
 1905 1910 1915 1920

gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc cgt atc caa aat gtg 5808
 Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile Gln Asn Val
 1925 1930 1935

gca gca ggt gag gtc agt gcc acc agc acc gat gcg gtc aat ggt agc 5856
 Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser
 1940 1945 1950

cag ttg tac aaa gcc acc caa agc att gcc aac gca acc aat gag ctt 5904
 Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu
 1955 1960 1965

gac cat cgt atc cac caa aac gaa aat aaa gcc aat gca ggg att tca 5952
 Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser
 1970 1975 1980

tca gcg atg gcg atg gcg tcc atg cca caa gcc tac att cct ggc aga 6000
 Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg
 1985 1990 1995 2000

tcc atg gtt acc ggg ggt att gcc acc cac aac ggt caa ggt gcg gtg 6048
 Ser Met Val Thr Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val
 2005 2010 2015

gca gtg gga ctg tcg aag ctg tcg gat aat ggt caa tgg gta ttt aaa 6096
 Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys
 2020 2025 2030

atc aat ggt tca gcc gat acc caa ggc cat gta ggg gcg gca gtt ggt 6144
 Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala Ala Val Gly
 2035 2040 2045

gca ggt ttt cac ttt 6159
 Ala Gly Phe His Phe
 2050

Figure 5. *Moraxella catarrhalis* les1 200kDa

ATG aat cac atc tat aaa gtc atc ttt aac aaa gcc aca ggc aca ttt		48
Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe		
1 5 10 15		
atg gcc gtg gca gag tgc gcc aaa tcc cac agc gga <u>qqq</u> agt agc agt		96
Met Ala Val Ala Glu Cys Ala Lys Ser His Ser Gly Gly Ser Ser Ser		
20 25 30		
agt acc gca gga cag gtg ggc agc tct cct gtc atc cgc ctg act cgt		144
Ser Thr Ala Gly Gln Val Gly Ser Ser Pro Val Ile Arg Leu Thr Arg		
35 40 45		
gtt gcc acg ctc gct atc cta gtg atc ggt gcg acg ctc aat ggc agt		192
Val Ala Thr Leu Ala Ile Leu Val Ile Gly Ala Thr Leu Asn Gly Ser		
50 55 60		
gct tat gct caa aat aat agc aag atc gca ttt ggt acc aca ggc aac		240
Ala Tyr Ala Gln Asn Asn Ser Lys Ile Ala Phe Gly Thr Thr Gly Asn		
65 70 75 80		
aat gac aat gcc tcg gct agc aat gaa gca tcc att gct att ggt agt		288
Asn Asp Asn Ala Ser Ala Ser Asn Glu Ala Ser Ile Ala Ile Gly Ser		
85 90 95		
ctt gct aag gca cat gcc aat caa gct att gct atc ggt ggt agc aaa		336
Leu Ala Lys Ala His Ala Asn Gln Ala Ile Ala Ile Gly Gly Ser Lys		
100 105 110		
cca gat cct cgt aat caa gcg gct aat cag aag gca ggt tcc cac gcc		384
Pro Asp Pro Arg Asn Gln Ala Ala Asn Gln Lys Ala Gly Ser His Ala		
115 120 125		
aaa ggt aaa gag tcc atc gcc atc ggt ggt gat gta ctg gct gag ggt		432
Lys Gly Lys Glu Ser Ile Ala Ile Gly Gly Asp Val Leu Ala Glu Gly		
130 135 140		
gat gcc tcg att gcc att ggt agt gat gac tta tat ttg gat agg aat		480
Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu Tyr Leu Asp Arg Asn		
145 150 155 160		
agc act aac tct aaa tat cca aat ggt ctt ctt agc act ctt att caa		528
Ser Thr Asn Ser Lys Tyr Pro Asn Gly Leu Leu Ser Thr Leu Ile Gln		
165 170 175		
aac cat aca gta tta cgc caa ata cga gac tca aat ggt tct cag aaa		576
Asn His Thr Val Leu Arg Gln Ile Arg Asp Ser Asn Gly Ser Gln Lys		
180 185 190		
tat aga cgc aca gca gca gaa gga cac gcc agt act gca gtg gga gcc		624
Tyr Arg Arg Thr Ala Ala Glu Gly His Ala Ser Thr Ala Val Gly Ala		
195 200 205		
atg gca tat gca aag ggt cat ttt gcc aac gcc ttt ggt aca cggt tca		672
Met Ala Tyr Ala Lys Gly His Phe Ala Asn Ala Phe Gly Thr Arg Ser		

210

215

220

aca gct gaa ggc aac tat tcc ttg gca gta ggt ctt acc gcc aaa gcc Thr Ala Glu Gly Asn Tyr Ser Leu Ala Val Gly Leu Thr Ala Lys Ala 225 230 235 240	720
gaa aaa gga tat aca atc gct att ggt tct aat gca caa gct atc aat Glu Lys Gly Tyr Thr Ile Ala Ile Gly Ser Asn Ala Gln Ala Ile Asn 245 250 255	768
tat gga gca cta gcc ctt ggt gca gat act cga gtt gat ttg gat tac Tyr Gly Ala Leu Ala Leu Gly Ala Asp Thr Arg Val Asp Leu Asp Tyr 260 265 270	816
ggt att gcc cta ggt tat ggt tct cag atc ctt aat aat aat aat aat Gly Ile Ala Leu Gly Tyr Ser Gln Ile Leu Asn Asn Asn Asn Asn 275 280 285	864
aat aat aat aaa gcc tat gta cca gaa ggt aat ggg tca aac ata aaa Asn Asn Asn Lys Ala Tyr Val Pro Glu Gly Asn Gly Ser Asn Ile Lys 290 295 300	912
tcg tct aaa gcc acc ggc aat ggt tta ttt tcc att ggt agt agc act Ser Ser Lys Ala Thr Gly Asn Gly Leu Phe Ser Ile Gly Ser Ser Thr 305 310 315 320	960
atc aag cgt aaa atc atc aat gtc ggt gca ggt tat gag gat acc gat Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Tyr Glu Asp Thr Asp 325 330 335	1008
gcg gtc aat gtg gca cag cta aaa gcg gtg gag aat ctg gct aag cgt Ala Val Asn Val Ala Gln Leu Lys Ala Val Glu Asn Leu Ala Lys Arg 340 345 350	1056
caa att act ttt aag ggt gat gat aac ggt act ggc gtt aag aaa aaa Gln Ile Thr Phe Lys Gly Asp Asp Asn Gly Thr Gly Val Lys Lys Lys 355 360 365	1104
ctg ggc gag act tta acc att aaa ggt ggt gag acc caa gcg gac aag Leu Gly Glu Thr Leu Thr Ile Lys Gly Glu Thr Gln Ala Asp Lys 370 375 380	1152
cta acc gat aat aat aac att ggt gtg gta aca gat aat aat act ggt Leu Thr Asp Asn Asn Ile Gly Val Val Thr Asp Asn Asn Thr Gly 385 390 395 400	1200
ctg aaa gtt aaa ctt gct aaa aac cta agc ggt ctt gaa aca gtt agc Leu Lys Val Lys Leu Ala Lys Asn Leu Ser Gly Leu Glu Thr Val Ser 405 410 415	1248
acc aaa aac cta acc gcc agc gag aaa gtt acg gta ggt agt ggt aat Thr Lys Asn Leu Thr Ala Ser Glu Lys Val Thr Val Gly Ser Gly Asn 420 425 430	1296
aac acc gct gag cta caa agc ggt ggt tta acc ttt acc cca aca aca Asn Thr Ala Glu Leu Gln Ser Gly Gly Leu Thr Phe Thr Pro Thr Thr 435 440 445	1344

DRAFT

aat gca agc aca gac aaa acc gtc tat ggc act gat ggg ctt aag ttt Asn Ala Ser Thr Asp Lys Thr Val Tyr Gly Thr Asp Gly Leu Lys Phe 450 455 460	1392
act gat aat tct aat acg gca ctt gaa gat act act cgt atc acc aaa Thr Asp Asn Ser Asn Thr Ala Leu Glu Asp Thr Thr Arg Ile Thr Lys 465 470 475 480	1440
gat aaa att ggt ttt agc aat aaa gct ggt aca gtt gat gaa aac aaa Asp Lys Ile Gly Phe Ser Asn Lys Ala Gly Thr Val Asp Glu Asn Lys 485 490 495	1488
cct tat ctt gat aaa gac aag cta aaa gtt ggc aac agc acc cta aac Pro Tyr Leu Asp Lys Asp Lys Leu Lys Val Gly Asn Ser Thr Leu Asn 500 505 510	1536
aac ggt ggc ttg act gtt aat aac acc att ggt ggt agc aat aaa caa Asn Gly Gly Leu Thr Val Asn Asn Thr Ile Gly Gly Ser Asn Lys Gln 515 520 525	1584
atc caa gtc ggt gct gat ggc att aaa ttt gcc gat gtg aat gtt aat Ile Gln Val Gly Ala Asp Gly Ile Lys Phe Ala Asp Val Asn Val Asn 530 535 540	1632
gta tca aat gcc gca aaa ttc ggc act act cgt att acc gaa gag gaa Val Ser Asn Ala Ala Lys Phe Gly Thr Thr Arg Ile Thr Glu Glu Glu 545 550 555 560	1680
att ggc ttt gct gat gct gat ggt aaa gtt gat aaa aag tca cca tat Ile Gly Phe Ala Asp Ala Asp Gly Lys Val Asp Lys Lys Ser Pro Tyr 565 570 575	1728
ttg gat aaa aaa caa ctt caa gtg ggt ggt gtt aaa att acc aaa gac Leu Asp Lys Gln Leu Gln Val Gly Gly Val Lys Ile Thr Lys Asp 580 585 590	1776
agt ggc att aat gca ggt gat caa aag atc agt aat gtt aaa gat gca Ser Gly Ile Asn Ala Gly Asp Gln Lys Ile Ser Asn Val Lys Asp Ala 595 600 605	1824
acg gac gat acc gat gca gtc act tat aaa cag ctt aaa caa gtc caa Thr Asp Asp Thr Asp Ala Val Thr Tyr Lys Gln Leu Lys Gln Val Gln 610 615 620	1872
caa gac gcc gac ggt gcc cta caa agc ttc tct att cgt gat gaa aaa Gln Asp Ala Asp Gly Ala Leu Gln Ser Phe Ser Ile Arg Asp Glu Lys 625 630 635 640	1920
ggt cag gaa ttt acg att agt aac ttg tat tct aat ggt aat acc cca Gly Gln Glu Phe Thr Ile Ser Asn Leu Tyr Ser Asn Gly Asn Thr Pro 645 650 655	1968
aat acc ttt gag acc atc acc ttt gca ggt gaa aac ggc atc agt atc Asn Thr Phe Glu Thr Ile Thr Phe Ala Gly Glu Asn Gly Ile Ser Ile 660 665 670	2016

CDS

agc aat gac ata gcc aaa ggt aaa gtc aaa gtt ggt att gac cca atc Ser Asn Asp Ile Ala Lys Gly Lys Val Lys Val Gly Ile Asp Pro Ile 675 680 685	2064
aat ggt ctc acc acg cct aag ctg acc gtg ggt agc gat aaa gat ggt Asn Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Ser Asp Lys Asp Gly 690 695 700	2112
aaa actcaa ttg gtt att gag caa gtg gct agc ggt aac gac acc aaa Lys Thr Gln Leu Val Ile Glu Gln Val Ala Ser Gly Asn Asp Thr Lys 705 710 715 720	2160
aac atc att aga gga ttg tcc cca aca ctg cct agc att acc aat gca Asn Ile Ile Arg Gly Leu Ser Pro Thr Leu Pro Ser Ile Thr Asn Ala 725 730 735	2208
ggg ggc gta cgc acc aca gaa cag ggc aat aca atc acc agc gac gaa Gly Gly Val Arg Thr Thr Glu Gln Gly Asn Thr Ile Thr Ser Asp Glu 740 745 750	2256
gac aaa tcc aaa gcc gcc agt atc ggt gat ata tta aat aca ggc ttt Asp Lys Ser Lys Ala Ala Ser Ile Gly Asp Ile Leu Asn Thr Gly Phe 755 760 765	2304
aac cta aaa aat aat agc aac tcc gtt ggc ttt gtc tcc act tat aac Asn Leu Lys Asn Asn Ser Asn Ser Val Gly Phe Val Ser Thr Tyr Asn 770 775 780	2352
act gtt gac ttt atc gat ggc aat gcc acc acc gct aag gta act tac Thr Val Asp Phe Ile Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr 785 790 795 800	2400
gat gaa acc aat caa acc agt aaa gta act tat gat gtc aat gtg gat Asp Glu Thr Asn Gln Thr Ser Lys Val Thr Tyr Asp Val Asn Val Asp 805 810 815	2448
gag aaa acc att gaa ctc aca ggc gat aat ggc aag aca aac aaa att Glu Lys Thr Ile Glu Leu Thr Gly Asp Asn Gly Lys Thr Asn Lys Ile 820 825 830	2496
ggc gtc aaa acc acc aca ctg acc aca aca aat gct aat ggt aaa gca Gly Val Lys Thr Thr Leu Thr Thr Asn Ala Asn Gly Lys Ala 835 840 845	2544
acc aac ttt agt acc acc gat aac gat gcc ctt gtt aac gcc aaa gac Thr Asn Phe Ser Thr Asp Asn Asp Ala Leu Val Asn Ala Lys Asp 850 855 860	2592
atc gcc gaa aat cta aac acc cta gcc aag gaa att cac acc acc aaa Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys 865 870 875 880	2640
ggc aca gca gac acc gcc cta caa acc ttt aaa gtc aaa aaa gac ggt Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Lys Val Lys Lys Asp Gly 885 890 895	2688
gca act gat gac gaa acc atc acc gtg ggt aaa gat ggt aca caa aac	2736

Ala Thr Asp Asp Glu Thr Ile Thr Val Gly Lys Asp Gly Thr Gln Asn			
900	905	910	
ggc aag acc gtc aac act cta aaa ctc aaa ggt gaa aac ggt cta acg			2784
Gly Lys Thr Val Asn Thr Leu Lys Leu Lys Gly Glu Asn Gly Leu Thr			
915	920	925	
gtt gct acc aat aaa gat ggt acg gtt acc ttt ggc att aac acc caa			2832
Val Ala Thr Asn Lys Asp Gly Thr Val Thr Phe Gly Ile Asn Thr Gln			
930	935	940	
agc ggt ctt aaa gcc ggc gac agc acc act cta aac aaa gat ggc ttg			2880
Ser Gly Leu Lys Ala Gly Asp Ser Thr Thr Leu Asn Lys Asp Gly Leu			
945	950	955	960
tct att aaa aac ccc gct agt aac gaa caa atc caa gtc ggt gct gat			2928
Ser Ile Lys Asn Pro Ala Ser Asn Glu Gln Ile Gln Val Gly Ala Asp			
965	970	975	
ggc gtg aag ttt gcc aag gtt gat aag ggt aat tca agc act ggc att			2976
Gly Val Lys Phe Ala Lys Val Asp Lys Gly Asn Ser Ser Thr Gly Ile			
980	985	990	
gat ggc aca agc cgt atc acc aaa gat caa att ggc ttt act ggg gct			3024
Asp Gly Thr Ser Arg Ile Thr Lys Asp Gln Ile Gly Phe Thr Gly Ala			
995	1000	1005	
aat ggc tca ctt gat acc acc aaa ccc cac cta acc aaa gac aag ctt			3072
Asn Gly Ser Leu Asp Thr Thr Lys Pro His Leu Thr Lys Asp Lys Leu			
1010	1015	1020	
aaa gtg ggt gaa gtt gaa att acc aac act ggc att aac gca ggt ggt			3120
Lys Val Gly Glu Val Glu Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly			
1025	1030	1035	1040
aaa aag att acc aac att caa tca ggt gat att acc caa aac agc aat			3168
Lys Lys Ile Thr Asn Ile Gln Ser Gly Asp Ile Thr Gln Asn Ser Asn			
1045	1050	1055	
gat gct gtg aca ggc ggt cgg gtt tat gat tta aaa acc gaa ctt gaa			3216
Asp Ala Val Thr Gly Gly Arg Val Tyr Asp Leu Lys Thr Glu Leu Glu			
1060	1065	1070	
agc aaa atc aac agt gct gct aaa aca gca caa aac tca tta cac gaa			3264
Ser Lys Ile Asn Ser Ala Ala Lys Thr Ala Gln Asn Ser Leu His Glu			
1075	1080	1085	
ttc tca gta gca gat gaa caa ggt aat cac ttt acg gtt agt aac cct			3312
Phe Ser Val Ala Asp Glu Gln Gly Asn His Phe Thr Val Ser Asn Pro			
1090	1095	1100	
tac tcc agt tat gac acc tca aag acc tct gat gtc atc acc ttt gca			3360
Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala			
1105	1110	1115	1120
ggt gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg cgt gtg			3408
Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val			

1125	1130	1135	
ggc att gac caa acc aaa ggc tta acc acg cct aag ctg acc gtg ggt Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly 1140	1145	1150	3456
aat aat aat ggc aaa ggc att gtc att gac agt aaa gat ggt caa aat Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Lys Asp Gly Gln Asn 1155	1160	1165	3504
acc atc aca gga cta agc aac act cta gct aat gtt acc aat gat ggt Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Gly 1170	1175	1180	3552
gca gga cac gca cta agc caa ggg ctt gcc aat gac acc gac aaa acc Ala Gly His Ala Leu Ser Gln Gly Leu Ala Asn Asp Thr Asp Lys Thr 1185	1190	1195	1200
cgt gcc gcc agc att ggt gat gtg cta aac gca ggc ttt aac ttg caa Arg Ala Ala Ser Ile Gly Asp Val Leu Asn Ala Gly Phe Asn Leu Gln 1205	1210	1215	3648
ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat gac act gtt gac Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asp 1220	1225	1230	3696
ttt atc gat ggc aat gcc acc acc gct aag gtg acc tat gac aca Phe Ile Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr 1235	1240	1245	3744
agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg gat aat aaa acc Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asn Lys Thr 1250	1255	1260	3792
att gaa gtg aca agt gat aaa aaa ctt ggc gtc aaa acc acc aca ctg Ile Glu Val Thr Ser Asp Lys Lys Leu Gly Val Lys Thr Thr Leu 1265	1270	1275	1280
acc aaa aca agt gct aat ggt aat gca acc aaa ttt agt gcc gcc gat Thr Lys Thr Ser Ala Asn Gly Asn Ala Thr Lys Phe Ser Ala Ala Asp 1285	1290	1295	3888
ggc gat gcc ctt gtt aaa gcc agt gat atc gcc acc cat cta aat acc Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Ala Thr His Leu Asn Thr 1300	1305	1310	3936
ttg gct ggc gac atc caa acc gcc aaa ggg gca agc caa gca agc agc Leu Ala Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Ser Ser 1315	1320	1325	3984
tca gca agc tat gtg gat gct gat ggc aac aag gtc atc tat gac agt Ser Ala Ser Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser 1330	1335	1340	4032
acc gat aag aag tac tat caa gtc aat gac aag ggt caa gtg gac aaa Thr Asp Lys Lys Tyr Tyr Gln Val Asn Asp Lys Gly Gln Val Asp Lys 1345	1350	1355	4080
		1360	

aac aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa gcc caa acc acc cca Asn Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro	1365	1370	1375	4128
gat ggc aca ttg gct caa atg aat gtc aaa tca gtc att aac aaa gag Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu	1380	1385	1390	4176
caa gta aat gat gcc aat aaa aag caa ggc atc aat gaa gac aac gcc Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala	1395	1400	1405	4224
ttt atc aaa ggg ctt gaa aac gcc gcc aaa gac acc aaa acc aaa aac Phe Ile Lys Gly Leu Glu Asn Ala Ala Lys Asp Thr Lys Thr Lys Asn	1410	1415	1420	4272
gcc gca gta act gtg ggt gat tta aat gcc gtt gcc caa aca ccg ctg Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu	1425	1430	1435	4320
acc ttt gca ggg gat aca ggc aca acg gct aaa aaa ctg ggc gag act Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr	1445	1450	1455	4368
ttg acc atc aaa ggt ggg caa aca gac acc aat aag cta acc gat aat Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn	1460	1465	1470	4416
aac atc ggt gtg gta gca ggt act gat ggc ttc act gtc aaa ctt gcc Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala	1475	1480	1485	4464
aaa gac cta acc aat ctt aac agc gtt aat gca ggt ggc acc aga att Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Arg Ile	1490	1495	1500	4512
gat gaa aaa ggc atc tct ttt gta gac gca aac ggt caa gcc aaa gca Asp Glu Lys Gly Ile Ser Phe Val Asp Ala Asn Gly Gln Ala Lys Ala	1505	1510	1515	4560
aac acc cct gtg cta agt gcc aat ggg ctg gac ctg ggt ggc aaa cgc Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Arg	1525	1530	1535	4608
atc agt aac atc ggt gca gct gtt gat gat aac gat gcg gtg aac ttt Ile Ser Asn Ile Gly Ala Ala Val Asp Asp Asn Asp Ala Val Asn Phe	1540	1545	1550	4656
aag cag ttt aat gaa gtt gcc aaa acg gtc aac aac cta aac aac caa Lys Gln Phe Asn Glu Val Ala Lys Thr Val Asn Asn Leu Asn Asn Gln	1555	1560	1565	4704
agt aac tca ggt gcg tca tta ccc ttt gtg gta acc gat gcc aat ggc Ser Asn Ser Gly Ala Ser Leu Pro Phe Val Val Thr Asp Ala Asn Gly	1570	1575	1580	4752

aag ccc atc aat ggc acc gat ggc aag ccc caa aaa gcc atc aag ggc Lys Pro Ile Asn Gly Thr Asp Gly Lys Pro Gln Lys Ala Ile Lys Gly	1585	1590	1595	1600	4800
gcc gat ggt aaa tac tat cac gcc aac gcc aac ggc gta cct gtg gac Ala Asp Gly Lys Tyr Tyr His Ala Asn Ala Asn Gly Val Pro Val Asp	1605	1610		1615	4848
aaa gat ggc aag ccc atc acc gat gcg gac aaa ctt gcc aat ctg gca Lys Asp Gly Lys Pro Ile Thr Asp Ala Asp Lys Leu Ala Asn Leu Ala	1620	1625		1630	4896
gct cat ggc aaa ccc ctt gat gca ggt cat caa gtg gtg gca agc cta Ala His Gly Lys Pro Leu Asp Ala Gly His Gln Val Val Ala Ser Leu	1635	1640		1645	4944
ggc ggc aac tca gat gcc atc acc cta acc aac atc aag tcc act ttg Gly Gly Asn Ser Asp Ala Ile Thr Leu Thr Asn Ile Lys Ser Thr Leu	1650	1655		1660	4992
cca caa att gac aca cca aac aca ggt aat gcc aat gca ggg caa gcc Pro Gln Ile Asp Thr Pro Asn Thr Gly Asn Ala Asn Ala Gly Gln Ala	1665	1670	1675	1680	5040
caa agt ctg ccc agc cta tca gca gca cag caa agt aat gct gcc agt Gln Ser Leu Pro Ser Leu Ser Ala Ala Gln Gln Ser Asn Ala Ala Ser	1685	1690		1695	5088
gtc aaa gat gtg cta aat gta ggc ttt aac ttg cag acc aat cac aat Val Lys Asp Val Leu Asn Val Gly Phe Asn Leu Gln Thr Asn His Asn	1700	1705		1710	5136
caa gtg gac ttt gtc aaa gcc tat gat acc gtc aac ttt gtc aat ggt Gln Val Asp Phe Val Lys Ala Tyr Asp Thr Val Asn Phe Val Asn Gly	1715	1720		1725	5184
aca ggt gcc gac atc aca agc gtg cgt agt gct gat ggc acg atg agt Thr Gly Ala Asp Ile Thr Ser Val Arg Ser Ala Asp Gly Thr Met Ser	1730	1735	1740		5232
aac atc acc gtc aac acc gcc tta gca gcg acc gat gat gat ggc aat Asn Ile Thr Val Asn Thr Ala Leu Ala Ala Thr Asp Asp Asp Gly Asn	1745	1750	1755	1760	5280
gtg ctt atc aaa gcc aaa gat ggt aag ttc tac aaa gca gac gac ctc Val Leu Ile Lys Ala Lys Asp Gly Lys Phe Tyr Lys Ala Asp Asp Leu	1765	1770		1775	5328
atg cca aac ggc tca cta aaa gca ggc aaa tca gcc agt gat gcc aaa Met Pro Asn Gly Ser Leu Lys Ala Gly Lys Ser Ala Ser Asp Ala Lys	1780	1785		1790	5376
act cca act ggt cta agc ctt gtt aac ccc aat gct ggt aaa ggc agt Thr Pro Thr Gly Leu Ser Leu Val Asn Pro Asn Ala Gly Lys Gly Ser	1795	1800	1805		5424
aca ggc gat gca gtg gct ctt aat aac tta tca aaa gcg gta ttt aaa					5472

Thr Gly Asp Ala Val Ala Leu Asn Asn Leu Ser Lys Ala Val Phe Lys
 1810 1815 1820

tcc aaa gat ggt aca act act acc aca gta agc tct gat ggc atc agt 5520
 Ser Lys Asp Gly Thr Thr Thr Val Ser Ser Asp Gly Ile Ser
 1825 1830 1835 1840

atc caa ggc aaa gat aac agc agc atc acc cta agc aaa gat ggg ctg 5568
 Ile Gln Gly Lys Asp Asn Ser Ser Ile Thr Leu Ser Lys Asp Gly Leu
 1845 1850 1855

aat gta ggc ggt aag gtc atc agc aat gtg ggt aaa ggc aca aaa gac 5616
 Asn Val Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp
 1860 1865 1870

acc gac gct gcc aat gta caa cag tta aac gaa gta cgc aac ttg ttg 5664
 Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu
 1875 1880 1885

ggt ctt ggt aat gct ggt aat gat aac gct gac ggc aat cag gta aac 5712
 Gly Leu Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn
 1890 1895 1900

att gcc gac atc aaa aaa gac cca aat tca ggt tca tca tct aac cgc 5760
 Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg
 1905 1910 1915 1920

act gtc atc aaa gca ggc acg gta ctt ggc ggt aaa ggt aat aac gat 5808
 Thr Val Ile Lys Ala Gly Thr Val Leu Gly Lys Gly Asn Asn Asp
 1925 1930 1935

acc gaa aaa ctt gcc act ggt ggt gta caa gtg ggc gtg gat aaa gac 5856
 Thr Glu Lys Leu Ala Thr Gly Gly Val Gln Val Gly Val Asp Lys Asp
 1940 1945 1950

ggc aac gct aac ggc gat tta agc aat gtt tgg gtc aaa acc caa aaa 5904
 Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys
 1955 1960 1965

gat ggc agc aaa aaa gcc ctg ctc gcc act tat aac gcc gca ggt cag 5952
 Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln
 1970 1975 1980

acc aac tat ttg acc aac aac ccc gca gaa gcc att gac aga ata aat 6000
 Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn
 1985 1990 1995 2000

gaa caa ggt atc cgc ttc ttc cat gtc aac gat ggc aat caa gag cct 6048
 Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro
 2005 2010 2015

gtg gta caa ggg cgt aac ggc att gac tca agt gcc tca ggc aag cac 6096
 Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His
 2020 2025 2030

tca gtg gcg ata ggt ttc cag gcc aag gca gat ggt gaa gcc gcc gtt 6144
 Ser Val Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val

2035	2040	2045	
gcc ata ggc aga caa acc caa gca ggc aac caa tcc atc gcc atc ggt Ala Ile Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly			6192
2050	2055	2060	
gat aac gca caa gcc acg ggc gat caa tcc atc gcc atc ggt aca ggc Asp Asn Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly			6240
2065	2070	2075	2080
aat gtg gta aca ggt aag cac tct ggt gcc atc ggc gac cca agc act Asn Val Val Thr Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr			6288
2085	2090	2095	
gtt aag gct gat aac agt tac agt gtg ggt aat aac aac cag ttt atc Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Ile			6336
2100	2105	2110	
gat gcc act cag acc gat gtc ttt ggt gtg ggc aat aac atc acc gtc Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val			6384
2115	2120	2125	
acc gaa agt aac tcg gtt gcc tta ggt tca aac tct gcc atc agt gca Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala			6432
2130	2135	2140	
ggc aca cac gca ggc aca caa gcc aaa aaa tct gac ggc aca gca ggt Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly			6480
2145	2150	2155	2160
aca acc acc aca gca ggt gca aca ggt acg gtt aaa ggc ttt gct gga Thr Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly			6528
2165	2170	2175	
caa acg gcg gtt ggt gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg			6576
2180	2185	2190	
cgt atc caa aat gtg gca gca ggt gag gtc agt gcc acc agc acc gat Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp			6624
2195	2200	2205	
gcg gtc aat ggt agc cag ttg tac aaa gcc acc caa ggc att gcc aac Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Gly Ile Ala Asn			6672
2210	2215	2220	
gca acc aat gag ctt gac cat cgt atc cac caa aac gaa aat aaa gcc Ala Thr Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala			6720
2225	2230	2235	2240
aat gca ggg att tca tca gcg atg gcg atg gcg tcc atg cca caa gcc Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala			6768
2245	2250	2255	
tac att cct ggc aga tcc atg gtt acc ggg ggt att gcc acc cac aac Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Ile Ala Thr His Asn			6816
2260	2265	2270	

ggt caa ggt gcg gtg gca gtg gga ctg tcg aag ctg tcg gat aat ggt 6864
Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly
2275 2280 2285

caa tgg gta ttt aaa atc aat ggt tca gcc gat acc caa ggc cat gta 6912
Gln Trp Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val
2290 2295 2300

ggg gcg gca gtt ggt gca ggt ttt cac ttt 6942
Gly Ala Ala Val Gly Ala Gly Phe His Phe
2305 2310

Figure 6. Alignment of amino acid sequence of 200kDa proteins of *M. catarrhalis* strains

TSD - KFSVKGSGTINNSLVTAEHLASYLNEVRNTADS - ALQSFTVKEEDDDDANAIIVAKDTTKNAGAVSILKLKGKNGLTVATKKD - GTVTGFLSODSGLTTIG 4223

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1310 1320 1330 1340 1350 1360 1370 1380 1390 1400
RVTYDTSKTSKVWYDVNDDTTIEVK-DKKLGVKFFTLTSTGIGANKFALSNOATGDALVKA
SDTIVAHLLNTSGDIQTAGASOANNSAGYTDADGNKVI
4223 Q8 LES-1

..... .NK. TS

..... K. SANG. ATKF. A. D. AT. A. SS. .S.

1410 1420 1430 1440 1450 1460 1470 1480 1490 1500
YDSTDNKYYOAQNIDGTVDKTKTEVAOKLVAQAQT PDEGLAQMNNTVKSVINKEQVN
DANKKQGINEDNAFAVKGLEKAASDNKTKNAAVTVGDLNAVQATPLT
4223 Q8 LES-1

..... K. VNDK. Q. N.

..... I. N. K. T.

1510 1520 1530 1540 1550 1560 1570 1580 1590
FAGDTGTTAKK - LGETLTGKGGQTDTNKLTDN - NIGVVAAGTDDGFTYKLA
DOLTLNNSYAGGTTKIDDKGTSFVDSGGQAKANTPVLSANGJDL
4223 Q8 LES-1

..... E. I. AN. R. E. I. AN. GKGRI

SNIGAAVDDNDAVNFQOFNEVAKTVNLNNQSNNSGASLPPFVUTDANGKPI
NGTIDGKPKQAIKGADGKYYHANANGVPVDKGKPTTDADKLANI
LAAGKGP
4223 Q8 LES-1

.....

LDAGHQVVASLGGNSDAITLTKSTLPQIDTPNTGNANAGQAQS
LPSLSAQQSNAASVKDVLNTYGFNLQTNHNQDFVKA
YDTVNFVNGTGADITSVR
4223 Q8 LES-1

SADGTMNSNITIVNIALAAATTDDGNVLIKA
DGKFYKADDLMPNGSLIAGKSASDAKTPGTLISVN
NAGKGSTGDAVANNLSKAVFKSDGTTTVSSD
4223 Q8 LES-1

印譜集卷之三

4223
Q8
LFS-1

1600 - GGKVLSNVG

GISI QGKD NS SITLSK DGLNV

1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
TGGTVKGAGQATAVGAVSGASGAERRIIONVAAGEVSATSTDAVNGSOLYKATOSIANATNELDHRIHQNENKANAGISSAMAMASMPQAYIPGRSMVTGG									
.....
G.....									
2010	2020	2030	2040						
LIAATHNGQGAVAVGLSKLSDNGQWVFKINGSADTQGHVGAAGVAGFHF*									
.....
*.....									

FIGURE 7

Construction of Plasmids Expressing Portions of the 200 kDa Protein Gene from Strain 4223

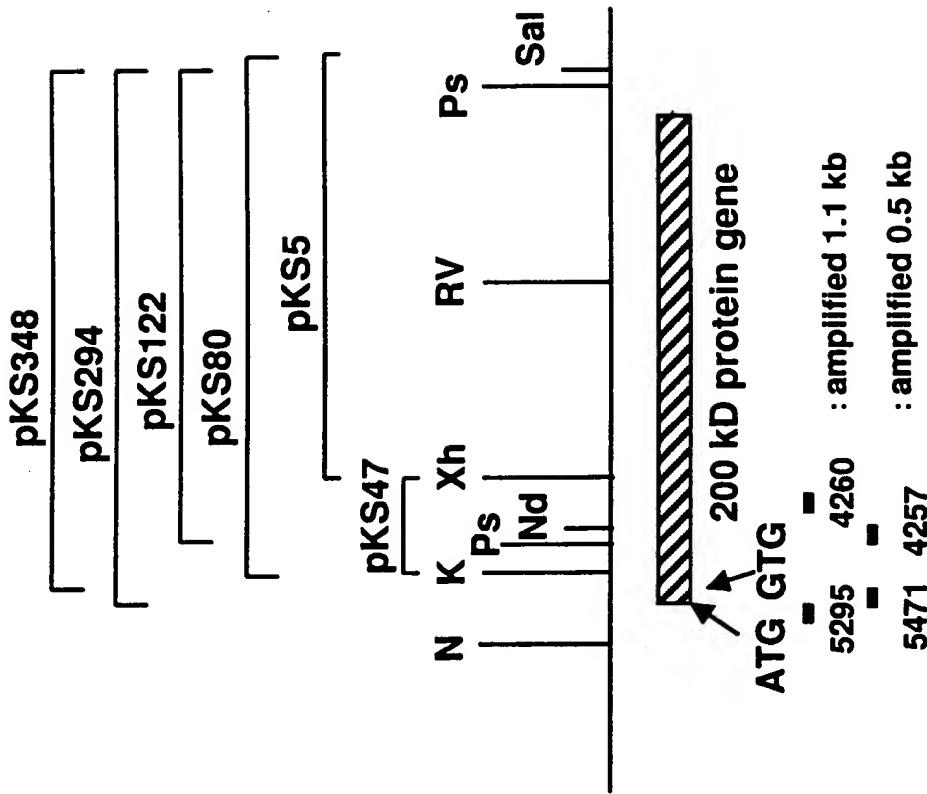


Figure 8. *M. catarrhalis* M56 200kDa gene in pKS348.

ATG atc ggt gca acg ctc agt ggc agt gct tat gct caa aaa aaa gat Met Ile Gly Ala Thr Leu Ser Gly Ser Ala Tyr Ala Gln Lys Lys Asp	48
1 5 10 15	
acc aaa cat atc gca att ggt gaa caa aac cag cca aga cgc tca ggc Thr Lys His Ile Ala Ile Gly Glu Gln Asn Gln Pro Arg Arg Ser Gly	96
20 25 30	
act gcc aag gcg gac ggt gat cga gcc att gct att ggt gaa aat gct Thr Ala Lys Ala Asp Gly Asp Arg Ala Ile Ala Ile Gly Glu Asn Ala	144
35 40 45	
aac gca cag ggc ggt caa gcc atc gcc atc ggt agt agt aat aaa act Asn Ala Gln Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr	192
50 55 60	
gtc aat gga agc agt ttg gat aag ata ggt acc gat gct acg ggt caa Val Asn Gly Ser Ser Leu Asp Lys Ile Gly Thr Asp Ala Thr Gly Gln	240
65 70 75 80	
gag tcc atc gcc atc ggt ggt gat gta aag gct agt ggt gat gcc tcg Glu Ser Ile Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser	288
85 90 95	
att gcc atc ggt agt gat gac tta cat ttg ctt gat cag cat ggt aat Ile Ala Ile Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn	336
100 105 110	
cct aaa cat ccg aaa ggt act ctg att aac gat ctt att aac ggc cat Pro Lys His Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His	384
115 120 125	
gca gta tta aaa gaa ata cga agc tca aag gat aat gat gta aaa tat Ala Val Leu Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr	432
130 135 140	
aga cgc aca acc gca agc gga cac gcc agt act gca gtg gga gcc atg Arg Arg Thr Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met	480
145 150 155 160	
tca tat gca cag ggt cat ttt tcc aac gcc ttt ggt aca cgg gca aca Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr	528
165 170 175	
gct aaa agt gcc tat tcc ttg gca gtg ggt ctt gcc gcc aca gcc gag Ala Lys Ser Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu	576
180 185 190	
ggc caa tct aca atc gct att ggt tct gat gca aca tct agc tcg ttg Gly Gln Ser Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu	624
195 200 205	
gga gcg ata gcc ctt ggt gca ggt act cgt gct cag cta cag ggc agt Gly Ala Ile Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser	672

210	215	220	
att gcc cta ggt caa ggt tct gtt gtc act cag agt gat aat aat tct Ile Ala Leu Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser 225 230 235 240			720
aga ccg gcc tat aca cca aat acc cag gca cta gac ccc aag ttt caa Arg Pro Ala Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln 245 250 255			768
gcc acc aat aat acg aag gcg ggt cca ctt tcc att ggt agt aac tct Ala Thr Asn Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser 260 265 270			816
atc aaa cgt aaa atc atc aat gtc ggt gca ggt gtt aat aaa acc gat Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp 275 280 285			864
gcg gtc aat gtg gca cag cta gaa gcg gtg gtg aag tgg gct aag gag Ala Val Asn Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu 290 295 300			912
cgt aga att act ttt cag ggt gat gat aac agt act gac gta aaa ata Arg Arg Ile Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile 305 310 315 320			960
ggg ttg gat aat act tta act att aaa ggt ggt gca gag acc aac gca Gly Leu Asp Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala 325 330 335			1008
tta acc gat aat aat atc ggt gtg gta aaa gag gct gat aat agt ggt Leu Thr Asp Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly 340 345 350			1056
ctg aaa gtt aaa ctt gct aaa act tta aac aat ctt act gag gtg aat Leu Lys Val Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn 355 360 365			1104
aca act aca tta aat gcc aca acc aca gtt aag gta ggt agt agt agt Thr Thr Leu Asn Ala Thr Thr Val Lys Val Gly Ser Ser Ser 370 375 380			1152
agt act aca gct gaa tta ttg agt gat agt tta acc ttt acc cag ccc Ser Thr Thr Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro 385 390 395 400			1200
aat aca ggc agt caa agc aca agc aaa acc gtc tat ggc gtt aat ggg Asn Thr Gly Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly 405 410 415			1248
gtg aag ttt act aat aat gca gaa aca aca gca gca atc ggc act act Val Lys Phe Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr 420 425 430			1296
cgt att acc aga gat aaa att ggc ttt gct cga gat ggt gat gtt gat Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp 435 440 445			1344

gaa aaa caa gca cca tat ttg gat aaa aaa caa ctt aaa gtg ggt agt		1392	
Glu Lys Gln Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser			
450	455	460	
gtt gca att acc ata gac aat ggc att gat gca ggt aat aaa aag atc		1440	
Val Ala Ile Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile			
465	470	475	480
agt aat ctt gcc aaa ggt agc agt gct aac gat gcg gtt acc atc gaa		1488	
Ser Asn Leu Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu			
485	490	495	
cag ctc aaa gcc gcc aag cct act tta aac gca ggc gct ggc atc agt		1536	
Gln Leu Lys Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser			
500	505	510	
gtc aca cct act gaa ata tca gtt gat gct aag agt ggc aat gtt acc		1584	
Val Thr Pro Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr			
515	520	525	
gcc cca act tac aac att ggc gtg aaa acc acc gag ctt aac agt gat		1632	
Ala Pro Thr Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp			
530	535	540	
ggc act agt gat aaa ttt agt gtt aag ggt agt ggc aac aat agc		1680	
Gly Thr Ser Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser			
545	550	555	560
tta gtt acc gcc gaa cat ttg gca agc tat cta aat gaa gtc aat cga		1728	
Leu Val Thr Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg			
565	570	575	
acg gct gac agt gct cta caa agc ttt acc gtt aaa gaa gaa gac gat		1776	
Thr Ala Asp Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp			
580	585	590	
gat gac gcc aac gct atc acc gtg gct aaa gat acg aca aaa aat gcc		1824	
Asp Asp Ala Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala			
595	600	605	
ggc gca gtc agc atc tta aaa ctc aaa ggt aaa aac ggt cta acg gtt		1872	
Gly Ala Val Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val			
610	615	620	
gct acc aaa aaa gat ggt acg gtt acc ttt ggg ctt agc caa gat agc		1920	
Ala Thr Lys Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser			
625	630	635	640
ggt ctg acc att ggc aaa agc acc cta aac aac gat ggc ttg act gtt		1968	
Gly Leu Thr Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val			
645	650	655	
aaa gat acc aac gaa caa atc caa gtc ggt gct aat ggc att aaa ttt		2016	
Lys Asp Thr Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe			
660	665	670	

act aat gtg aat ggt aat cca ggt act ggc att gca aat acc gct		2064
Thr Asn Val Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala		
675	680	685
cgc att acc aga gat aaa att ggc ttt gct ggt tct gat ggt gca gtt		2112
Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val		
690	695	700
gat aca aac aaa cct tat ctt gat caa gac aag cta caa gtt ggc aat		2160
Asp Thr Asn Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn		
705	710	715
720		
gtt aag att acc aac act ggc att aac gca ggt ggt aaa gcc atc aca		2208
Val Lys Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr		
725	730	735
ggg ctg tcc cca aca ctg cct agc att gcc gat caa agt agc cgc aac		2256
Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn		
740	745	750
ata gaa ctg ggc aat aca atc caa gac aaa gac aaa tcc aac gct gcc		2304
Ile Glu Leu Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala		
755	760	765
agc att aat gat ata tta aat aca ggc ttt aac cta aaa aat aat aac		2352
Ser Ile Asn Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn		
770	775	780
aac ccc att gac ttt gtc tcc act tat gac att gtt gac ttt gcc aat		2400
Asn Pro Ile Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn		
785	790	795
800		
ggc aat gcc acc acc gcc aca gta acc cat gat acc gct aac aaa acc		2448
Gly Asn Ala Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr		
805	810	815
agt aaa gtg gta tat gat gtg aat gtg gat gat aca acc att cat cta		2496
Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu		
820	825	830
aca ggc act gat gac aat aaa aaa ctt ggc gtc aaa acc acc aaa ctg		2544
Thr Gly Thr Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu		
835	840	845
aac aaa aca agt gct aat ggt aat aca gca act aac ttt aat gtt aac		2592
Asn Lys Thr Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn		
850	855	860
tct agt gat gaa gat gcc ctt gtt aac gcc aaa gac atc gcc gaa aat		2640
Ser Ser Asp Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn		
865	870	875
880		880
cta aac acc cta gcc aag gaa att cac acc acc aaa ggc aca gca gac		2688
Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp		
885	890	895
acc gcc cta caa acc ttt acc gtt aaa aag gta gat gaa aat aat aat		2736

Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn			
900	905	910	
gct gat gac gcc aac gcc atc acc gtc ggt caa aag aac gca aat aat			2784
Ala Asp Asp Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn			
915	920	925	
caa gtc aac acc cta aca ctc aaa ggt gaa aac ggt ctt aat att aaa			2832
Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys			
930	935	940	
acc gac aaa aat ggt acg gtt acc ttt ggc att aac acc aca agc ggt			2880
Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly			
945	950	955	960
ctt aaa gcc ggc aaa agc acc cta aac gac ggt ggc ttg tct att aaa			2928
Leu Lys Ala Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys			
965	970	975	
aac ccc act ggt agc gaa caa atc caa gtc ggt gct gat ggc gtg aag			2976
Asn Pro Thr Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys			
980	985	990	
ttt gcc aag gtt aat aat aat ggt gtt gta ggt gct ggc att gat ggc			3024
Phe Ala Lys Val Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly			
995	1000	1005	
aca act cgc att acc aga gat gaa att ggc ttt act ggg act aat ggc			3072
Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly			
1010	1015	1020	
tca ctt gat aaa agc aaa ccc cac cta agc aaa gac ggc att aac gca			3120
Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala			
1025	1030	1035	1040
ggt ggt aaa aag att acc aac att caa tca ggt gag att gcc caa aac			3168
Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn			
1045	1050	1055	
agc cat gat gct gtg aca ggc ggc aag att tat gat tta aaa acc gaa			3216
Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu			
1060	1065	1070	
ctt gaa aac aaa atc agc agt act gcc aaa aca gca caa aac tca tta			3264
Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu			
1075	1080	1085	
cac gaa ttc tca gta gca gat gaa caa ggt aat aac ttt acg gtt agt			3312
His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser			
1090	1095	1100	
aac cct tac tcc agt tat gac acc tca aag acc tct gat gtc atc acc			3360
Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr			
1105	1110	1115	1120
ttt gca ggt gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg			3408
Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val			

1125	1130	1135	
cgt gtg ggc att gac caa acc aaa ggc tta acc acg cct aag ctg acc Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr 1140	1145	1150	3456
gtg ggt aat aat aat ggc aaa ggc att gtc att gac agc caa aat ggt Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly 1155	1160	1165	3504
caa aat acc atc aca gga cta agc aac act cta gct aat gtt acc aat Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn 1170	1175	1180	3552
gat aaa ggt agc gta cgc acc aca gaa cag ggc aat ata atc aaa gac Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp 1185	1190	1195	3600
gaa gac aaa acc cgt gcc gcc agc att gtt gat gtg cta agc gca ggc Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly 1205	1210	1215	3648
ttt aac ttg caa ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr 1220	1225	1230	3696
gac acc gtc aac ttt gcc gat ggc aat gcc acc acc gct aag gtg acc Asp Thr Val Asn Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr 1235	1240	1245	3744
tat gat gac aca agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val 1250	1255	1260	3792
gat gat aca acc att gaa gtt aaa gat aaa aaa ctt ggc gta aaa acc Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr 1265	1270	1275	3840
acc aca ttg acc agt act ggc aca ggt gct aat aaa ttt gcc cta agc Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser 1285	1290	1295	3888
aat caa gct act ggc gat gcg ctt gtc aag gcc agt gat atc gtt gct Asn Gln Ala Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala 1300	1305	1310	3936
cat cta aac acc tta tct ggc gac atc caa act gcc aaa ggg gca agc His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser 1315	1320	1325	3984
caa gcg aac aac tca gca ggc tat gtg gat gct gat ggc aat aag gtc Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val 1330	1335	1340	4032
atc tat gac agt acc gat aac aag tac tat caa gcc aaa aat gat ggc Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly 1345	1350	1355	4080

aca gtt gat aaa acc aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa		4128
Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln		
1365	1370	1375
 gcc caa acc cca gat ggc aca ttg gct caa atg aat gtc aaa tca gtc		4176
Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val		
1380	1385	1390
 att aac aaa gaa caa gta aat gat gcc aat aaa aag caa ggc atc aat		4224
Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn		
1395	1400	1405
 gaa gac aac gcc ttt gtt aaa gga ctt gaa aaa gcc gct tct gat aac		4272
Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn		
1410	1415	1420
 aaa acc aaa aac gcc gca gta act gtg ggt gat tta aat gcc gtt gcc		4320
Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala		
1425	1430	1435
1440		
 caa aca ccg ctg acc ttt gca ggg gat aca ggc aca acg gct aaa aaa		4368
Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys		
1445	1450	1455
 ctg ggc gag act ttg acc atc aaa ggt ggg caa aca gac acc aat aag		4416
Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys		
1460	1465	1470
 cta acc gat aat aac atc ggt gtg gta gca ggt act gat ggc ttc act		4464
Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr		
1475	1480	1485
 gtc aaa ctt gcc aaa gac cta acc aat ctt aac agc gtt aat gca ggt		4512
Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly		
1490	1495	1500
 ggc acc aaa att gat gac aaa ggc gtg tct ttt gta gac tca agc ggt		4560
Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly		
1505	1510	1515
1520		
 caa gcc aaa gca aac acc cct gtg cta agt gcc aat ggg ctg gac ctg		4608
Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu		
1525	1530	1535
 ggt ggc aag gtc atc agt aat gtg ggc aaa ggc aca aaa gat acc gac		4656
Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp		
1540	1545	1550
 gct gcc aat gta caa cag tta aac gaa gta cgc aac ttg ttg ggt ctt		4704
Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu		
1555	1560	1565
 ggt aat gct ggt aat gat aac gct gac ggc aat cag gta aac att gcc		4752
Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala		
1570	1575	1580

gac atc aaa aaa gac cca aat tca ggt tca tca tct aac cgc act gtc 4800
Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Asn Arg Thr Val
1585 1590 1595 1600

atc aaa gca ggc acg gta ctt ggc ggt aaa ggt aat aac gat acc gaa 4848
Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu
1605 1610 1615

aaa ctt gcc act ggt ggt ata caa gtg ggc gtg gat aaa gac ggc aac 4896
Lys Leu Ala Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn
1620 1625 1630

gct aac ggc gat tta agc aat gtt tgg gtc aaa acc caa aaa gat ggc 4944
Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly
1635 1640 1645

agc aaa aaa gcc ctg ctc gcc act tat aac gcc gca ggt cag acc aac 4992
Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn
1650 1655 1660

tat ttg acc aac aac ccc gca gaa gcc att gac aga ata aat gaa caa 5040
Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln
1665 1670 1675 1680

ggt atc cgc ttc ttc cat gtc aac gat ggc aat caa gag cct gtg gta 5088
Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val
1685 1690 1695

caa ggg cgt aac ggc att gac tca agt gcc tca ggc aag cac tca gtg 5136
Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val
1700 1705 1710

gcg ata ggt ttc cag gcc aag gca gat ggt gaa gcc gcc gtt gcc ata 5184
Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile
1715 1720 1725

ggc aga caa acc caa gca ggc aac caa tcc atc gcc atc ggt gat aac 5232
Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn
1730 1735 1740

gca caa gcc acg ggc gat caa tcc atc gcc atc ggt aca ggc aat gtg 5280
Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val
1745 1750 1755 1760

gta gca ggt aag cac tct ggt gcc atc ggc gac cca agc act gtt aag 5328
Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys
1765 1770 1775

gct gat aac agt tac agt gtt ggt aat aac aac cag ttt acc gat gcc 5376
Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Gln Phe Thr Asp Ala
1780 1785 1790

act caa acc gat gtc ttt ggt gtg ggc aat aac atc acc gtg acc gaa 5424
Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu
1795 1800 1805

agt aac tcg gtt gcc tta ggt tca aac tct gcc atc agt gca ggc aca 5472

Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr
1810 1815 1820

cac gca ggc aca caa gcc aaa aaa tct gac ggc aca gca ggt aca acc 5520
His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr
1825 1830 1835 1840

acc aca gca ggt gca acc ggt acg gtt aaa ggc ttt gct gga caa acg 5568
Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr
1845 1850 1855

gcg gtt ggt gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc cgt atc 5616
Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile
1860 1865 1870

caa aat gtg gca gca ggt gag gtc agt gcc acc agc acc gat gcg gtc 5664
Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val
1875 1880 1885

aat ggt agc cag ttg tac aaa gcc acc caa agc att gcc aac gca acc 5712
Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr
1890 1895 1900

aat gag ctt gac cat cgt atc cac caa aac gaa aat aag gcc aat gca 5760
Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala
1905 1910 1915 1920

ggg att tca tca gcg atg gcg atg gcc atg cca caa gcc tac att 5808
Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile
1925 1930 1935

cct ggc aga tcc atg gtt acc ggg ggt att gcc acc cac aac ggt caa 5856
Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln
1940 1945 1950

ggt gcg gtg gca gtg gga ctg tcg aag ctg tcg gat aat ggt caa tgg 5904
Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp
1955 1960 1965

gta ttt aaa atc aat ggt tca gcc gat acc caa ggc cat gta ggg gcg 5952
Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala
1970 1975 1980

gca gtt ggt gca ggt ttt cac ttt taagccataa atcgcaagat tttactaaa 6006
Ala Val Gly Ala Gly Phe His Phe
1985 1990

aatcaatctc accatagttg tataaaacag catcagcatc agtcatatatta ctgatgctga 6066

tgttttttat cacttaaacc attttacccgc tcaagtgatt ctctttcacc atgaccaaat 6126

cgccattgat cataggtaaa cttattgagt aaatttatc aatgttagttg ttagatatgg 6186

ttaaaattgt gccattgacc aaaaaatgac cgatttatcc cgaaaatttc tgattatgat 6246

ccgttgacct gca 6259

Figure 9A Construction of pKS294

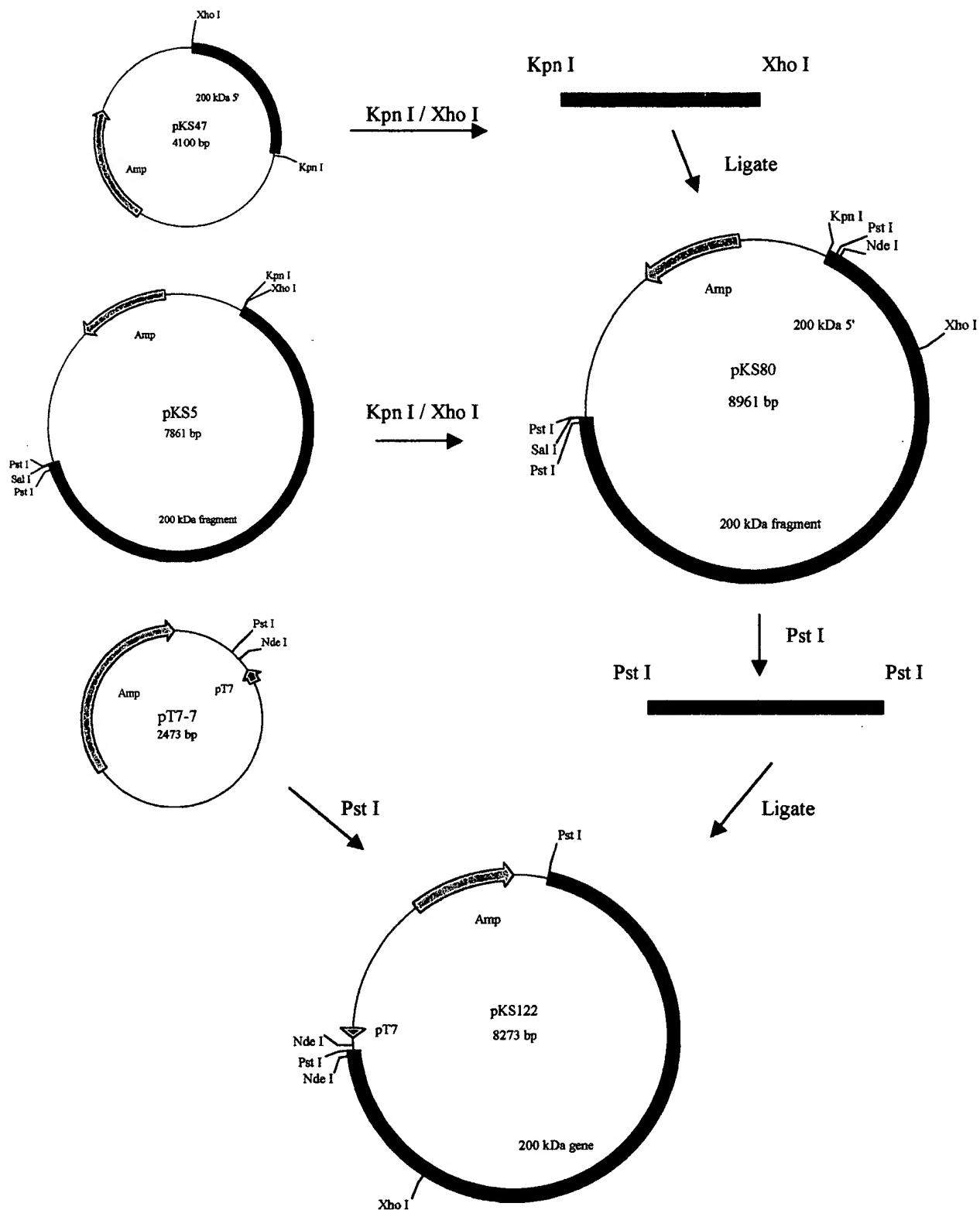


Figure 9B Construction of pKS294

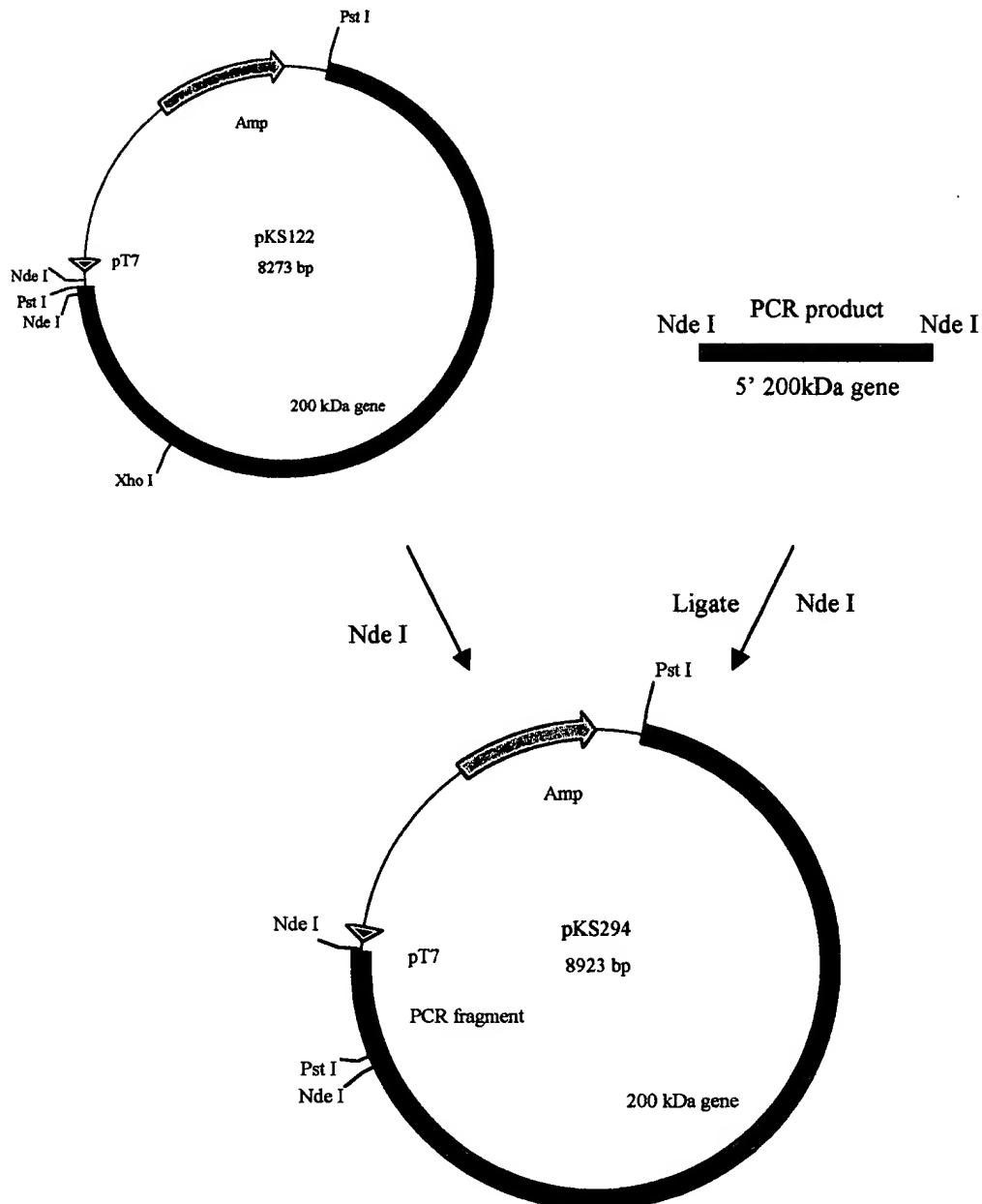


Figure 10. Construction of pKS348

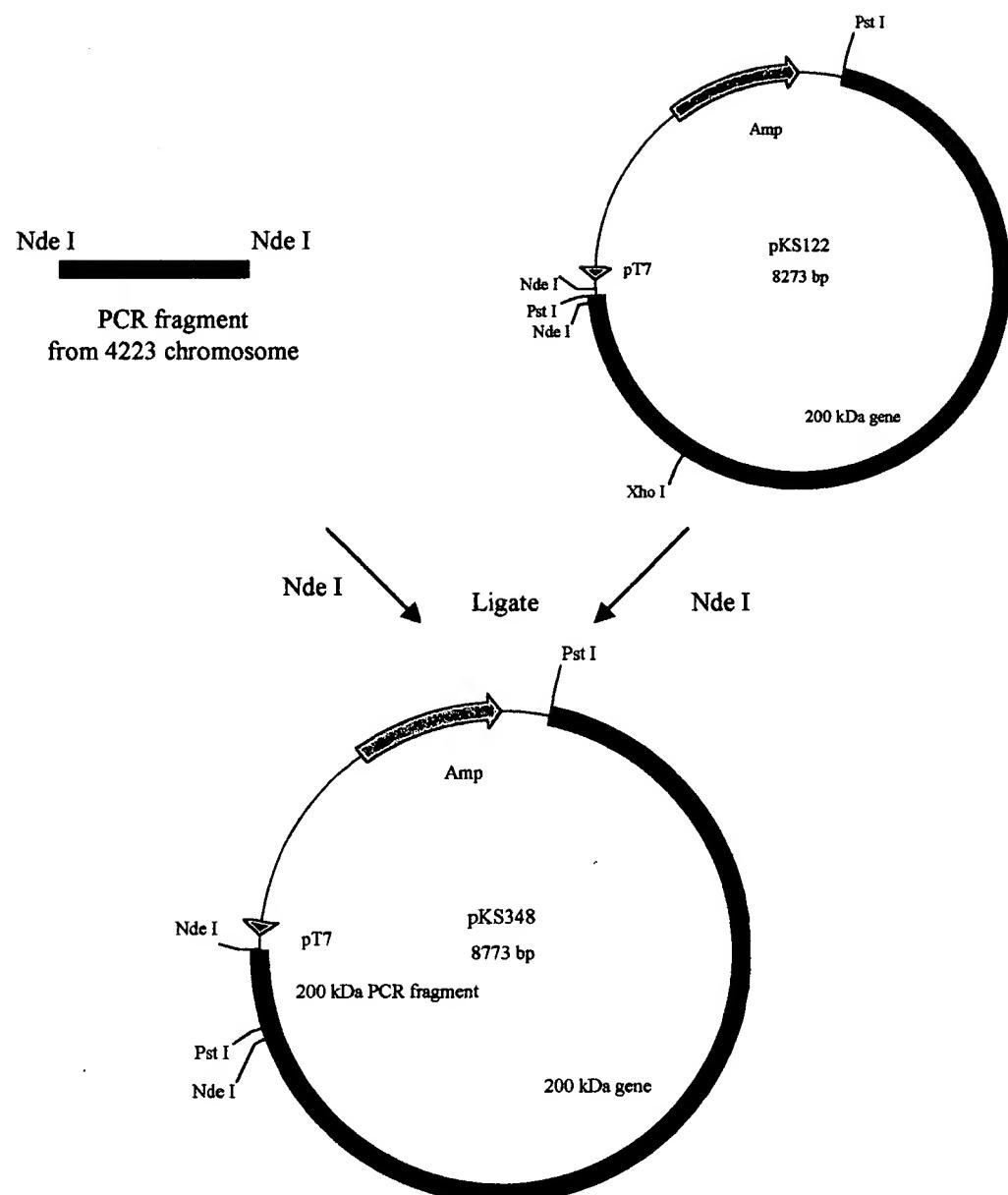
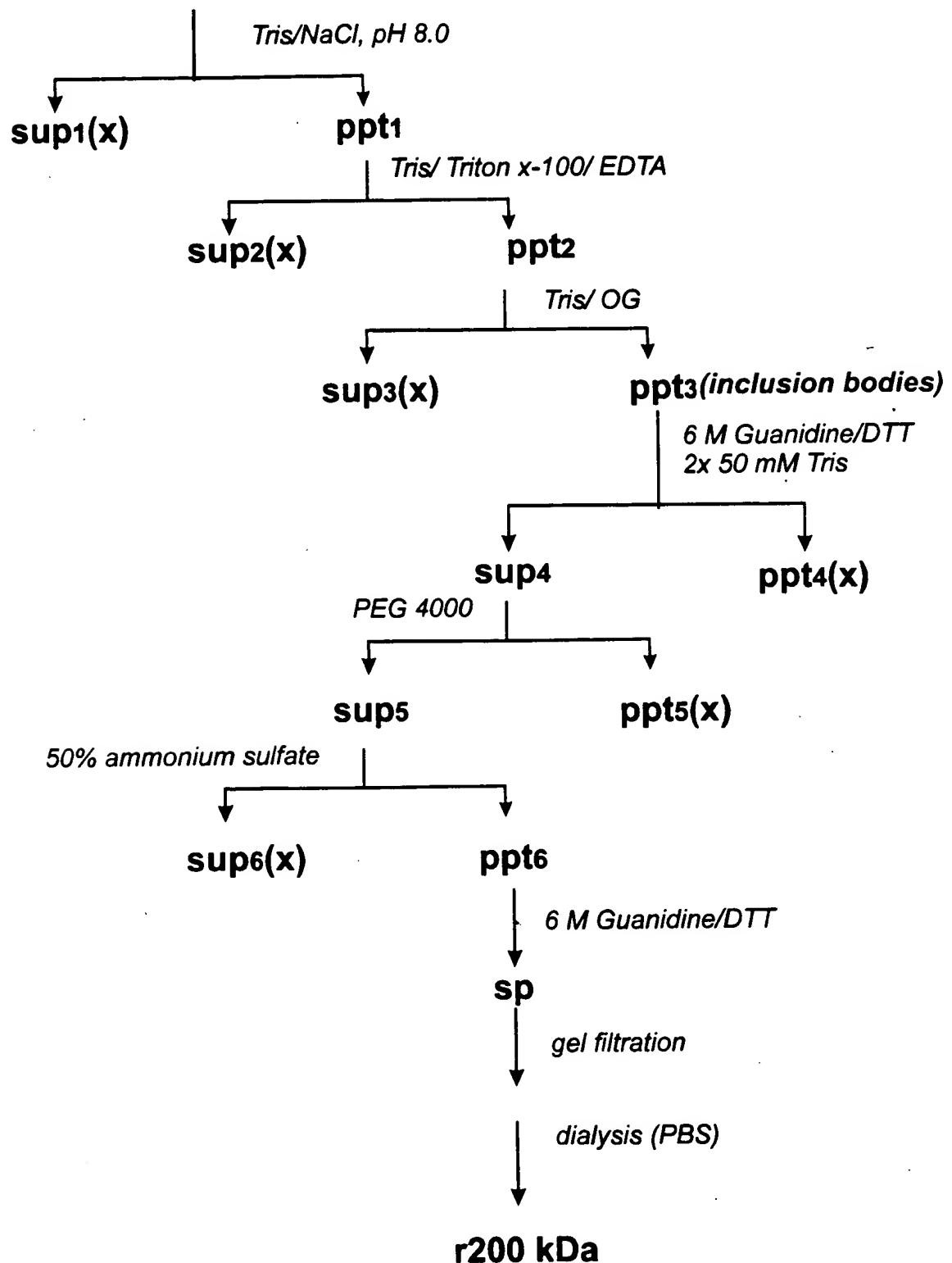


FIGURE 11

Purification of r200 kDa Protein from *E. coli*

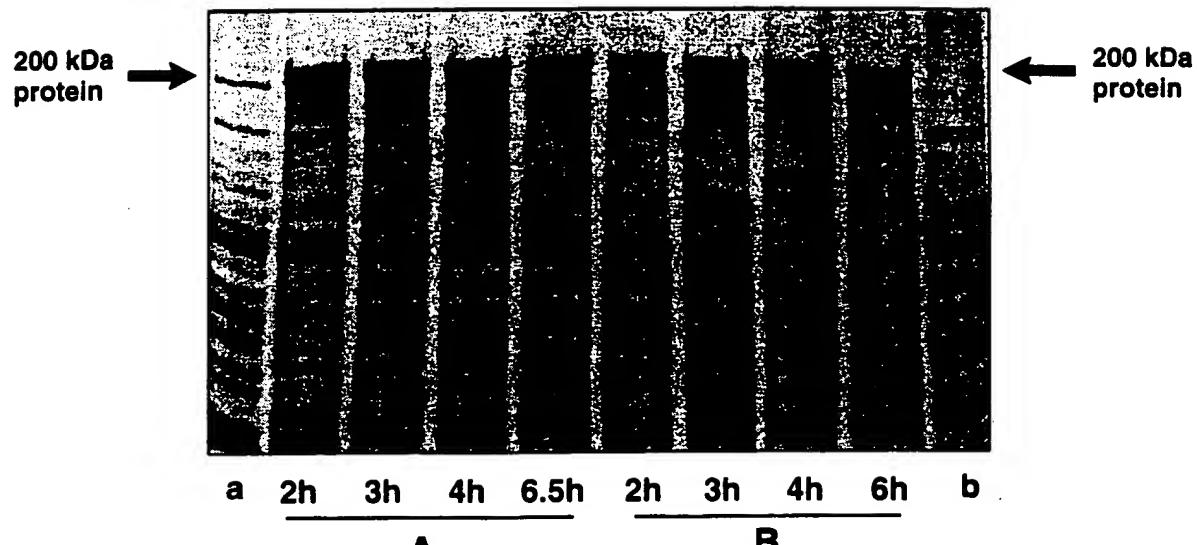
***E. coli* Whole Cell**



098114-0025250

FIGURE 12

Expression of M56 r200 kDa Protein Gene in *E. coli*



A: KS358 induced when O.D. ^{at} 600 nm was 0.26

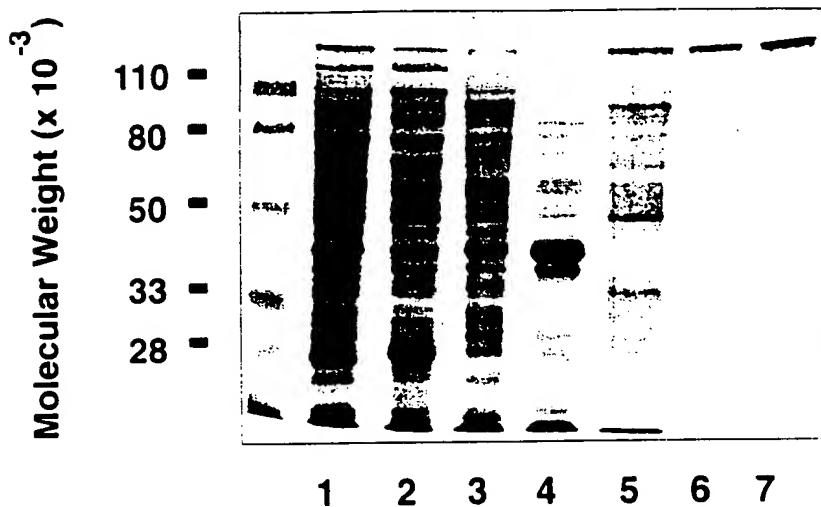
B: KS358 induced when O.D. at 600 nm was 0.44

a: strain 4223 lysate

b: KS358 cultured overnight

FIGURE 13

Purification of M56 r200 kDa Protein (4223)



1. ***E. coli* Whole cells**
2. **Soluble proteins after 50 mM Tris/ NaCl, pH 8, extraction**
3. **Soluble proteins after Tris/ Triton X-100/ EDTA extraction**
4. **Soluble proteins after Tris/ OG extraction**
5. **Pellet after Tris/ OG extraction**
- 6-7. **Purified 200 kDa protein**

FIGURE 14

Anti-M56 r200 kDa Antibody Titers in Mice

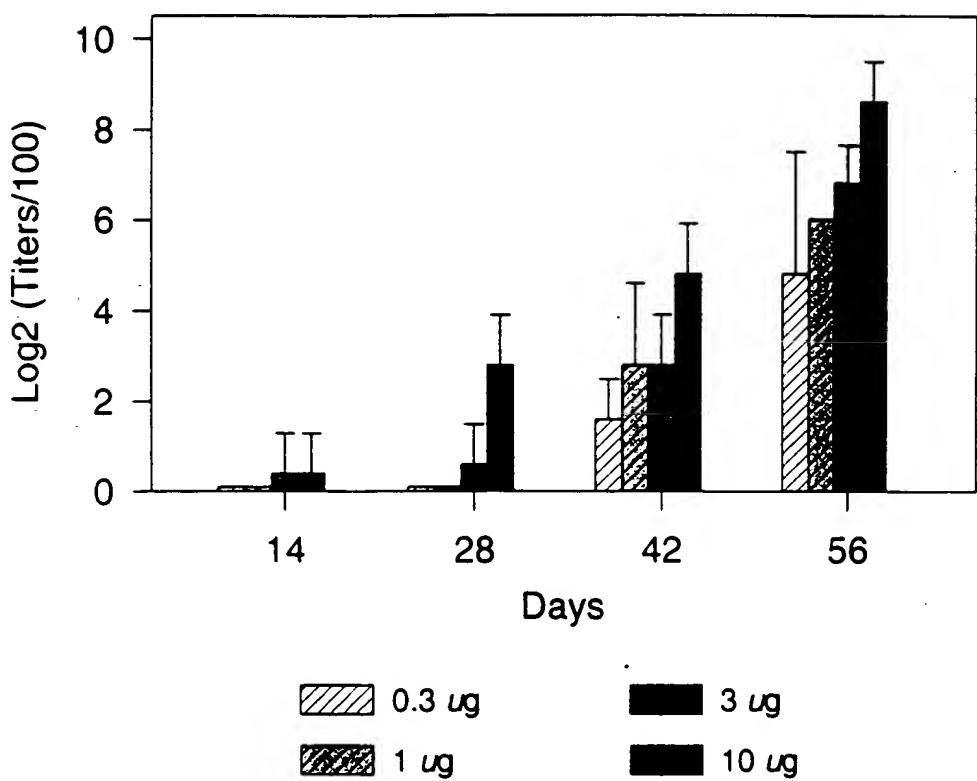


FIGURE 15

Anti-M56 r200 kDa Antibody Titers in Guinea Pigs

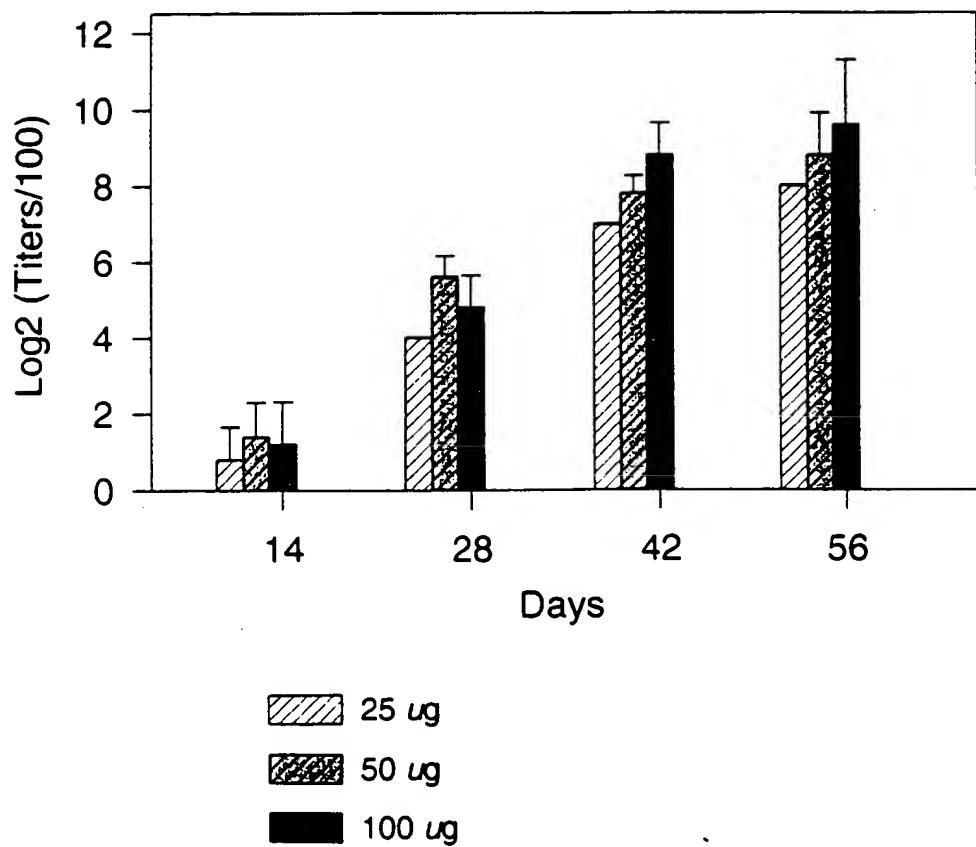


FIGURE 16

PCR amplification of DNA fragments carrying a portion of the
200 kDa protein gene from chromosomal DNA of RH408

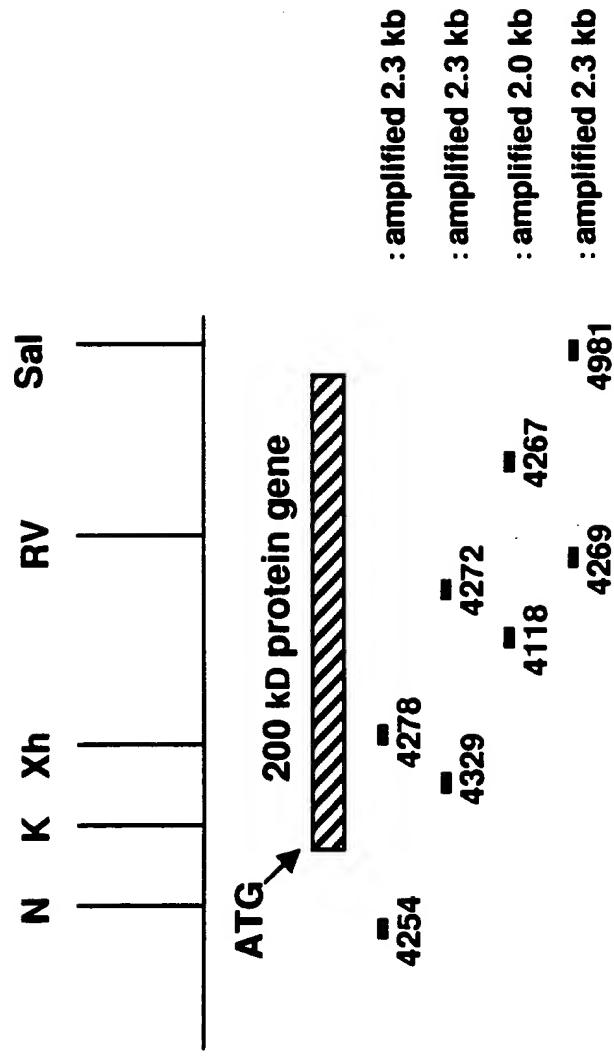


Figure 17

M. catarrhalis strain 4223 200 kDa

↓
CCATGGATATGGGCAGGTGTGCTGCCGTATGATGGCGATGACACCCCATTGCC
10 20 30 40 50 60

CATATCTGTACGATTTGACATGTGATATGATTTAACATGTGACATGATTTAACATTTGTTT
70 80 90 100 110 120

AATACTGTTGCCATCATTACCAATAATTAGTAACGCATTAGTAACGCATTGTAAGGAAAT
130 140 150 160 170 180

CATTGCGCCCCTTATGTTATCATATGAATAGAATATTATGATTGTATCTGATTATTGT
190 200 210 220 230 240

ATCAGAACATGGTGATGCTATATGATGATGCCAACGAGTTGATTGGGTTAAATCACTCTATG
250 260 270 280 290 300

ATTTGATATATTTGAAACTAACATCTATTGACTTAAATCACCATATGGTTATAATTAGCA
310 320 330 340 350 360

TAATGGTAGGCTTTTGTAAGGAAATCACATCGCAATATTGTTCTACTGTTACTACCAGCT
370 380 390 400 410 420

TGAATGACGATCCCAATCACCAAGATTCAAGTGATGTTGGTATACGCACCAATTAA
430 440 450 460 470 480

CCCTAATTATTCAATCAAATGCCATGTCAGCATGATCATTTTTAAGGTAAACCA
490 500 510 520 530 540

↓
MET ASN HIS ILE TYR LYS VAL ILE PHE ASN LYS ALA¹² THR GLY THR PHE MET ALA VAL¹⁹ ALA
CATGAATCACATCTATAAAGTCATCTTAACAAAGCCACAGGCACATTATGGCAGTGGC
550 560 570 580 590 600

↓
GLU TYR ALA LYS SER HIS SER THR GLY GLY GLY SER CYS ALA THR GLY GLN VAL GLY³⁹ SER
AGAGTACGCCAAATCCCACAGCACGGGGGGGGTAGCTGTGCTACAGGGCAAGTTGGCAG
610 620 630 640 650 660

↓
VAL CYS THR LEU SER PHE ALA ARG ILE ALA ALA LEU ALA VAL LEU VAL⁵⁶ ILE GLY ALA THR
TGTATGCACCTCTGAGCTTGCCCCGTATTGCCGGCTCGCTGTCCCTCGTGTACGGTGCAAC
670 680 690 700 710 720

FIGURE 18
3' Half Constructs of 200 kD Protein Gene

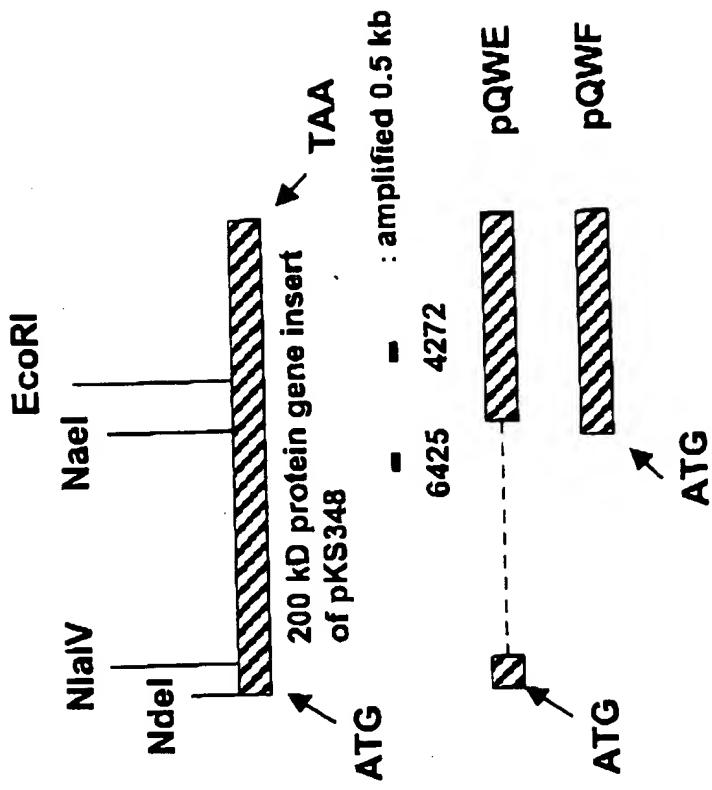


Figure 19 Construction of pQWE

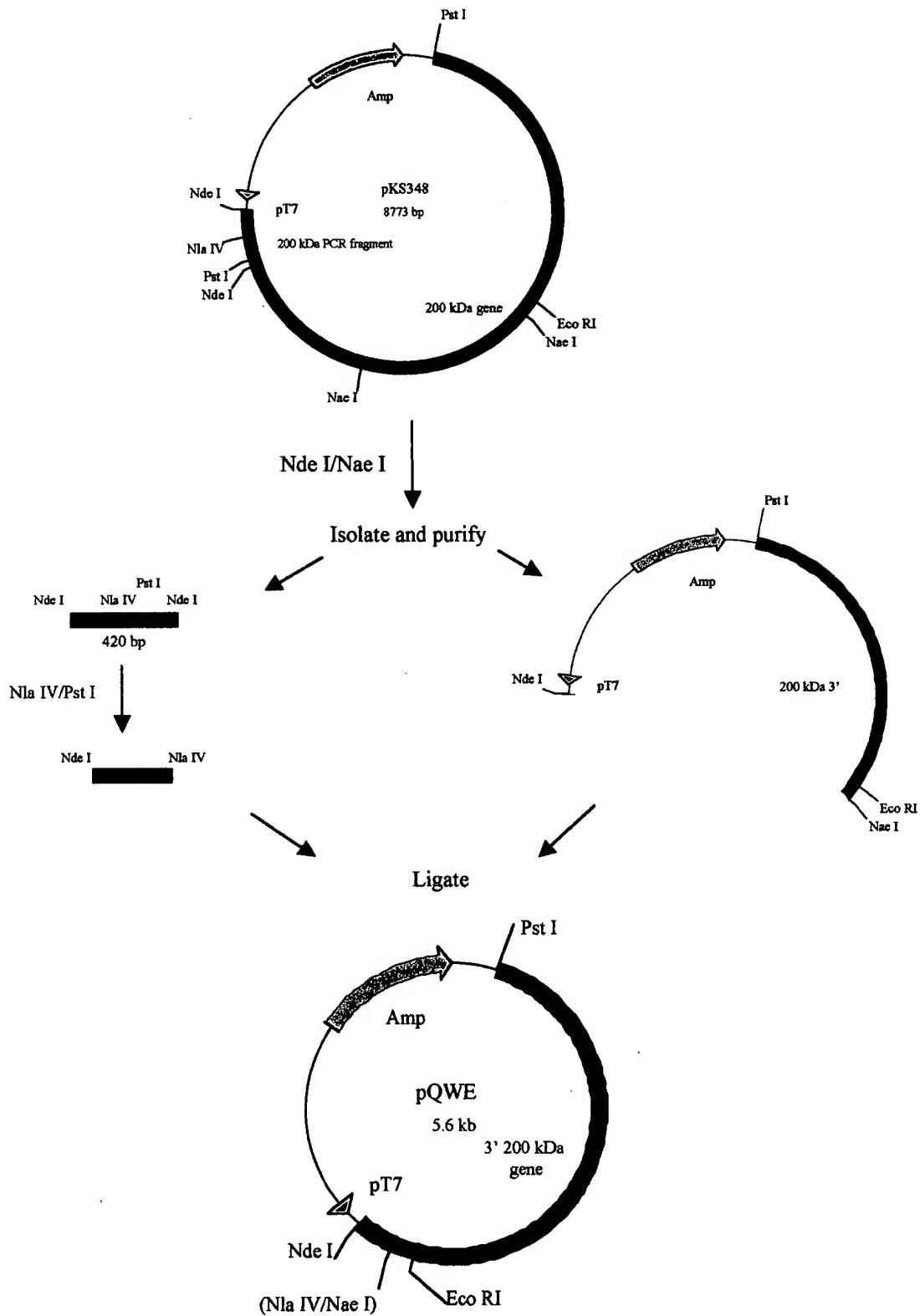


Figure 20 Construction of pQWF

